Railway Age Gazette

SECOND HALF OF 1917—No. 26 SIXTY-SECOND YEAR

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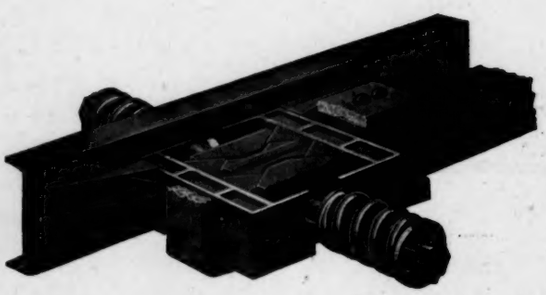

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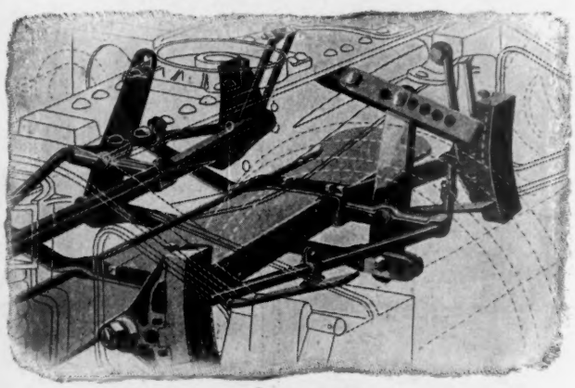

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PRESIDENT WILSON TAKES OVER THE RAILWAYS

ON Wednesday night, after this edition of the *Railway Age Gazette* was ready for the press, President Wilson issued a proclamation taking over control of the railways and appointing Secretary of the Treasury McAdoo the director general of railroads. The plans suggested by the President for compensating the railways are not as good as railway managers hoped for, but they are as good as could reasonably be expected, and the duty of all railway men is to now turn in and help Mr. McAdoo make a complete success of his big task. The President's proclamation will be found on page 1170.

The Rate of Return on Railway Investment

Both the gross and net earnings of the railroads in 1916 were so large that when measured in billions and millions they seemed to give evidence of astounding prosperity and it is only when expressed in terms of the percentage earned on the investment that their true character is seen. So many glowing accounts have been published of the results of railway operation in 1916 that, even at the risk of adding to the confusion of figures, we cannot refrain from calling attention to the fact that the Interstate Commerce Commission in a table published in its annual report to Congress last week, states the percentage of operating income to property investment for the fiscal year 1916 as only 5.8 for roads of Class I and Class II and their non-operating subsidiaries. In its annual report for 1916 it published an estimated figure of 6.35 per cent. In the *Railway Age Gazette* of September 29, 1916, there was published an estimate that the rate of return for that year would hardly exceed 5.6 per cent and on January 12, 1917, we published another estimate of 5.9 per cent for the calendar year 1916. The commission's report now gives a new estimate of 6.5 per cent for the 12 months ending June 30, 1917. With the idea that possibly the commission's method of estimating may have again produced a result as much more favorable than the revised figures will show as it did in 1916, we have had another analysis of the available statistics for 1917 made by the Bureau of Railway Economics and get a result of approximately 5.7 per cent. In the course of time, when the Interstate Commerce Commission's official statistical reports finally emerge from the congestion of the government printing office, we shall accept the result there stated, but while estimates are being made we feel at liberty to call attention to the fact that the commission's method of estimating from the Class I roads alone produces a higher average rate of return than is obtained by using the operating income of the million dollar roads and making an estimate for the roads of Class I and Class III. This produces an operating income for the 12 months ending June 30, 1917, of $1,090,000,000. After deducting an estimate for the taxes of lessor companies, and hire of equipment, joint facilities and miscellaneous rents, on the basis of the 1916 figures, we get a net operating income of $1,050,000,000 or $4,237 per mile, which on the basis of $74,000 per mile investment produces an average return of 5.72 per cent. The Interstate Commerce Commission in its estimate apparently does not make the deductions referred to but uses a figure of $1,069,750,000 for operating income, instead of calculating the *net* operating income. As the commission has reduced its estimate for 1916 from over 6 per cent to 5.8 per cent it is not impossible that, when its official statistics are issued, the result for 1917 will be found to be less favorable than has been generally assumed.

Co-operation With Accounting Department

In carrying out the recommendations of the Special Committee of the Association of American Railway Accounting Officers, which are printed elsewhere in this issue, accounting officers will need the co-operation of the executives and of the heads of other departments especially in regard to the installation of mechanical devices and the elimination of unnecessary statistics. Appropriations for anything in the nature of a capital expenditure are particularly hard to get now, but it would be penny wisdom of the worst kind to fail to substitute, wherever expedient, mechanical devices for man power. The recommendation that unnecessary statistics be eliminated affects all departments, but the operating more than any other, perhaps. Probably steps have already been taken to do away

with unnecessary statistics on many roads but it is safe to say that there is still a great mass of figures being compiled which is pretty nearly useless, arriving at the general manager's desk, as it does, forty-five to sixty days after the events recorded. Supervision by means of statistics is more than ever essential under present circumstances but a few logical and searching reports made up within a few hours of the events recorded are more effective for purposes of supervision than an armful of reports completed "the fifteenth of the following month." Operating officers and executives especially ought to read every word of the accounting officers' committee report.

THE FAILURE, NOT OF RAILROAD ADMINISTRATION, BUT OF RAILROAD REGULATION

THE government is going to take direct supervision of the railroad management during the war. It is going to do this because our present system of railroad regulation has broken down. The Interstate Commerce Commission recently has made two important reports which bear directly on this subject. One is its annual report for 1917; the other, the special report regarding the need for unification of railroad facilities which it sent to Congress on December 5. The former is a vindication of the operation of the railways since the United States entered the war; the latter, as we view it, a condemnation of much of our past government regulation of railroads.

Those who say the need for government supervision of operation during the war is due to a break-down of railroad management should read these two reports and ponder their significance when taken together.

In its annual report the Commission said: "Transportation conditions have been abnormal throughout the entire country during the past year. * * * Even before our country was drawn into the war the railroads were handling an extremely heavy traffic, heavier by far than at any time in their previous history. This was greatly increased by the war. * * * Since 1907 there were few times when the number of freight cars available did not exceed the number required for the transportation of the country's commerce. * * * As a result of this condition, there was slight incentive to secure additional equipment, and on many lines the idle cars were allowed to deteriorate."

The recent enormous increase in traffic, as the Commission points out, rapidly wiped out the car surplus. "Through the railroads' Commission on Car Service efforts have been made to relieve the difficulties resulting in car shortage and congestion. * * * Without attempting to detail the activities on the part of the railways through this organization, it will suffice to say that they have responded to and supported the executive committee (i. e., the Railroads' War Board), which in an earnest way has attempted to deal with the vexatious and troublesome questions and to meet the unprecedented demands upon the railroads. * * * While conditions have been extraordinary and while traffic is not always moved as carriers and shippers would have it moved, the essential needs of the country have to date been cared for. Much was said during the past winter as to the danger of freezing and famine on account of failure adequately to transport fuel and foods, but history will record no such calamity."

In the entire report there is not a word of criticism of the railroads for what they have done or not done since the country entered the war. The conditions have been abnormal and the railroads, with the co-operation of the Commission itself and the shipping public, have done the best they could in the circumstances. This, in substance, is the Commission's report.

Fully as significant as what the Commission says in its annual report, and even more forcefully worded, are the views expressed by Secretary of War Baker in his annual report for 1917 (pages 39-40) regarding the way in which the railroads have co-operated with the War Department. He says:

"In this general connection it seems appropriate to refer to the effective co-operation between the department and the transportation agencies of the country. For a number of years the Quartermaster General's Department has maintained close relations with the executives of the great railway systems of the country. In February, 1917, a special committee of the American Railway Association was appointed to deal with questions of national defense, and the co-operation between this committee and the department has been most cordial and effective, and but for some such arrangement the great transportation problem would have been insoluble. **I am happy, therefore, to join the Quartermaster General in pointing out the extraordinary service rendered by the transportation agencies of the country, and I concur also in his statement that 'of those who are now serving the Nation in this time of stress, there are none who are doing so more whole-heartedly, unselfishly and efficiently than the railroad officials who are engaged in this patriotic work.'"**

Contrast this with what the Commission says in its special report of December 5 to Congress. Complete unification of the operation of the railroads is necessary, it declares. "If the unification is to be effected by the carriers," it continues, "they should be enabled to effect it in a lawful way by the suspension during the period of the war of the operation of the anti-trust laws, except in respect of consolidations or mergers, and of the anti-pooling section of the Commerce Act." The only alternative is the appointment of a government railroad controller who would be able to disregard these laws.

Why must the railroads in one way or another be freed from the anti-trust and the anti-pooling laws? Because, as the Commission points out, those laws were passed to compel the roads to compete, and they cannot secure the greatest efficiency in the utilization of existing facilities without eliminating competition and working as a single system. In other words, the great obstacles to securing maximum transportation efficiency in this crisis are law-made obstacles and not railroad-made obstacles. As a matter of fact, the Sherman anti-trust law and the anti-pooling law, as has been pointed out by the *Railway Age Gazette* and by other students of railway problems, with "damnable iteration" for many years, always have been obstacles to efficient railroad operation and regulation.

In its special report the Commission says: "The sudden, unforeseen and unprecedented demand for transportation occasioned by the war placed a strain upon the facilities and equipment of the railways which they were not and are not prepared to meet. There was created a need for immediate and extensive additions to existing facilities and equipment. The need is conincident with demands upon capital as well as upon labor, manufactures and natural resources such as we have never before known. Important additions and betterments will require new capital." The Commission recognizes it as its duty to grant rates to cover all necessary expenses and a fair return upon the value of the properties, but takes the view that no rates it could grant would enable the railways to compete successfully against the government in the open market for the new capital they require. Therefore, it suggests a direct government loan or guarantee to enable the railways to raise the needed capital.

It is true, as the Commission indicates, that nobody foresaw that a great war would cause such a large increase in the demand for transportation. But it has been foreseen and predicted for over ten years that some cause or combination of causes would sooner or later result in an enormous increase in business, and that then if the policy of regulation being followed was persisted in the transportation facilities of the country would prove to be inadequate. Rail-

way facilities have now become inadequate for the very reason that students of the situation foresaw they would, viz., because the various regulating bodies have refused to let the railways earn enough return to raise the capital required to make facilities adequate. Regulation so restricted the earnings of the railways that in the years 1914 and 1915 the percentages of return earned were the lowest since 1899. The period of enormous increase in traffic followed directly on the heels of this period when railroad net earnings, owing to unwise regulation, reached the lowest point in fifteen years. There you have the explanation of present transportation conditions—conditions which were clearly foreseen, which were repeatedly predicted, and which the kind of regulation we have had made inevitable.

Since the "break-down" is not a break-down of railroad management, but of railroad regulation, why did President Wilson consider it necessary to appoint a government controller for the railways? Apparently because he thought only a government controller could remove the obstacles to efficient operation and to needed increases in facilities which have been created by government regulation. If the President is right in this matter, it is quite evident that much of past regulation has been wrong.

TWO TYPES OF SNOW SHEDS

ON another page of this issue an account is given of a novel form of construction for the protection of railway tracks against drifting snow. The snow sheds there described are in marked contrast to the extensive improvements made by the Great Northern in the Cascade mountains which were described in last week's issue. This difference results from the fact that snow sheds are classified in two distinct groups designed to protect against entirely different troubles. The sheds on the Canadian Pacific in Rogers Pass and those on the Chicago, Milwaukee & St. Paul on the Great Northern in the Cascade mountains have been built to protect the railways from avalanches, heavy masses of snow and debris which sweep down the mountain sides and produce formidable obstructions to a railway occupying a bench in the slope. Here the construction takes the form of an apron or chute, built in the hillside over the track of sufficient strength to withstand the weight of the sliding mass as it passes over on its way to the bottom of the canyon. The sheds of the Southern Pacific in the Sierra Nevada mountains and the recently completed sheds of the Union Pacific belong to an entirely different class, the former being located on mountain sides of moderate slope and the latter in flat or rolling country. These sheds afford protection against drifting snow carried by never-ending winds of high velocity.

The snow sheds are confined to limited districts where the unusual conditions prevail. The westward slopes of the Pacific Coast ranges offer an unusual condition in an extremely heavy snowfall. The average annual fall in the vicinity of the Southern Pacific sheds is 35 ft. and a maximum of 65 ft. has been attained twice in 10 years. In the mountains of western Washington, annual snowfalls of 50 ft. are not uncommon. Unusual conditions of an entirely different nature demanded the construction of snow sheds on the Union Pacific and are described in the article referred to above.

These snow troubles introduce an enormous liability in railway operation. The construction and maintenance of the required protection represent investments of millions of dollars for which there is no compensation in the form of decreased operating expenses. The work described in this issue covers a form of permanent construction that has been carried to a degree of perfection which has justified its application on a large scale. In the case of the protection against snow slides, the use of permanent construction can hardly be said to have been solved satisfactorily. Reinforced concrete has had only trial applications, while most of the recent construction has been entirely of heavy timber. As a result the expense for maintenance and renewals is great as can well be expected in any structure containing as much as 2,000 ft. b. m. of untreated timber per running foot. Even on the lighter construction used by the Southern Pacific the annual maintenance expenditure amounts to $100,000.

GOVERNMENT CONTROL AND RAILROAD EFFICIENCY

THE public should understand just what the assumption by the government of control of railroad operation means. It will mean that the government will take control of an organization which has rendered to it and to the public more efficient service since this country entered the war than any organization which the government itself has formed especially to deal with war conditions.

What governmental department or organization will anybody attempt to show has done any better than the railroads? The record of the railroads repeatedly has been made public. It speaks for itself, and it speaks eloquently. But, it is said, the railroads have "broken down." With almost no additional facilities they have so increased their efficiency that they are handling 50 per cent more business than they were two years ago; and yet it is said, "they have broken down"; and the remedy is increased government control.

But where is the evidence that they could do any better under increased government control? Certainly it is not to be found in the storm of accusations of inefficiency which is now being poured upon the various government departments and bureaus. Almost every organization which the government itself has formed to help carry on the activities incidental to the war is under fire. The principal organizations of this kind are the Shipping Board, the Food Administration and the Fuel Administration. The Shipping Board is under attack in Congress because it has not made enough progress with the shipbuilding program. The Fuel Administration is under attack because it has not handled the coal situation efficiently. The Food Administration is under attack mainly because there is a shortage of sugar.

Likewise, some branches of the war and navy departments are under fire. The Surgeon-General of the army has alleged that many soldiers are suffering from cold and are sick of pneumonia because they have not been provided with proper clothing. The Ordnance Department is being denounced for various and sundry short-comings, including its failure to adopt the Lewis gun promptly or to provide General Pershing's army with enough arms.

The *Railway Age Gazette* does not pretend to know the merits of the controversies which have arisen regarding these and other matters pertaining to the government's handling of the situation. We believe the present chairman of the Shipping Board and his associates are men of great ability and are doing their best. But everybody knows that the work of shipbuilding has been terribly delayed by the protracted wrangling and constant succession of changes in personnel which have occurred in the shipbuilding organization. We believe the head of the Fuel Administration has done his best; but can anybody be found who believes his work has been constructive and successful in the big way the conditions have demanded? Most people whose opinion is of value think Mr. Hoover is a very able man, and that he has dealt with the difficult problem with great energy and effectiveness; and yet the Food Administration is receiving bitter criticism on various grounds and from various sources. It is true there has been a serious congestion on the eastern railroads; but that congestion itself was due largely to failure on the part of the government departments to exercise proper control over the issuance of orders for preference in the movement of freight.

There is grave uncertainty as to whether the government

has proceeded along all or, indeed, along most lines, with real efficiency. And yet it is soberly contended that it should take over the operation of the railways in order to increase their efficiency; and some of the very people who most savagely criticise the alleged inefficiency of the present government departments and organizations are the most energetic in contending that the railways, under government control, would be operated more efficiently! Their logic is remarkable. The government does other things badly; therefore, it would operate railways well.

THE PRESENT IMPORTANCE OF WATER TREATMENT

ONE of the essential requirements of steam railway operation is an adequate quantity of water for locomotive use. Second only in importance to quantity is quality. While the results of an insufficient supply of water are evident at once the detrimental effects of a poor character of water are not so readily observed though they are just as real. As a result the quality of railway water supplies frequently does not receive the consideration which it deserves.

The effect of an unsatisfactory water supply is reflected in locomotive performance. The *economy* of keeping an engine out of the shops and at work at all times is generally understood. The *necessity* for so employing it under present conditions should be realized by all railway men. At a time when the roads are overwhelmed with traffic, when they do not have enough engines to handle the business and when new ones cannot be obtained, every influence which tends to increase the amount of time that engines stand idle in the shops should be studied carefully and eliminated if practicable.

Poor water is one of the factors effecting locomotive performance adversely. Not only does it increase the consumption of fuel and shorten the interval between trips to the shop but it increases the number of engine failures on the line. If these conditions were not preventable, there would not be room for criticism but sufficient progress has been made to demonstrate that the quality of the water can be improved to the extent that these conditions can be removed in large measure if not eliminated entirely.

The lack of attention to water treatment has resulted largely from the failure of railway men to realize the full economies which can be effected. This has followed the division of responsibility for water service between the engineering department which procures and delivers the water to the engine, the mechanical department which uses it and the operating department which is dependent on its use for the hauling of traffic. No one department, therefore, sees the entire problem through. Another cause for this condition is the fact that on many roads the detrimental effects of bad water have existed so long that the managements have come to take them as a matter of course. They are not, therefore, giving the subject the consideration which it deserves. Other officers think only of the importance of treating the supplies at those points where extremely bad water is found and lose sight of the fact that large quantities of water with smaller amounts of scale-forming ingredients are also serious. Consideration of the condition at such points will also show the opportunities for vast improvement in many instances.

There has never been a time when the treatment of water has assumed the importance which it now bears to railway operation. The expense for the improvement of the water supply is so small in comparison with the benefits to be derived, particularly under present conditions, that the subject warrants the most careful consideration. The removal of solids from bad water is economical at any time. It is doubly so now when the roads are straining every nerve to furnish the transportation demanded by the country.

Letters to the Editor

WHY THESE UNNECESSARY STOPS?

St. Paul, Minn.

To the Editor of the Railway Age Gazette:

On a certain single-track railroad equipped with the "A.P.B." automatic block system, there is a piece of maximum grade, adverse from X to Y. Between these points are three intermediate "stop and proceed" signals which we may designate as a, b and c. If the train, having passed a clear home signal at X finds one of the intermediate signals, say b, at stop, it must be brought to a full stop before proceeding, at reduced speed, to c, although there may be 4,000 tons behind the engine, to start which on the maximum grade is something of an undertaking, consuming much valuable time and occasionally resulting in a draw-bar pulled out and a double to Y. The stop indication may have meant one of many things, sometimes nothing more serious than a broken wire.

The object sought to be attained is the assurance that the train will be moved from b to c with such caution as would be indicated as necessary to the mind of a reasonable man trained in the business of railroading; but the method used to accomplish this end is an extremely unreasonable one.

I wish to submit the following, based to some extent on an experience of thirteen years as trainmaster and superintendent, directly responsible for the discipline of many men:

1. A rule requiring a train to be brought to a full stop at a signal under conditions such as described above is unreasonable and unnecessary [whether on ascending or descending grades or on a level], as all the requirements of safety can be met by reducing its speed to ten miles an hour.

2. To bring any train to a full stop at a signal in the expectation that the stop will have any effect on its being run carefully through the block is unreasonable, except that the stop, if it can be enforced, will limit the speed to that which can be attained thereafter.

3. An unreasonable rule is practically unenforceable, and, by comparison, a reasonable rule is easy to enforce.

4. A rule that is not enforced is subversive of discipline.

5. It is a waste of money to make unnecessary stops at any time and with any train, but especially so on heavy adverse grades.

6. Enginemen, in the main, are conscientious; take a pride in doing their work well, and do considerable thinking. These are human attributes for which they do not always get credit. They have no heart for an unreasonable rule, but can very readily see the necessity for a reasonable one.

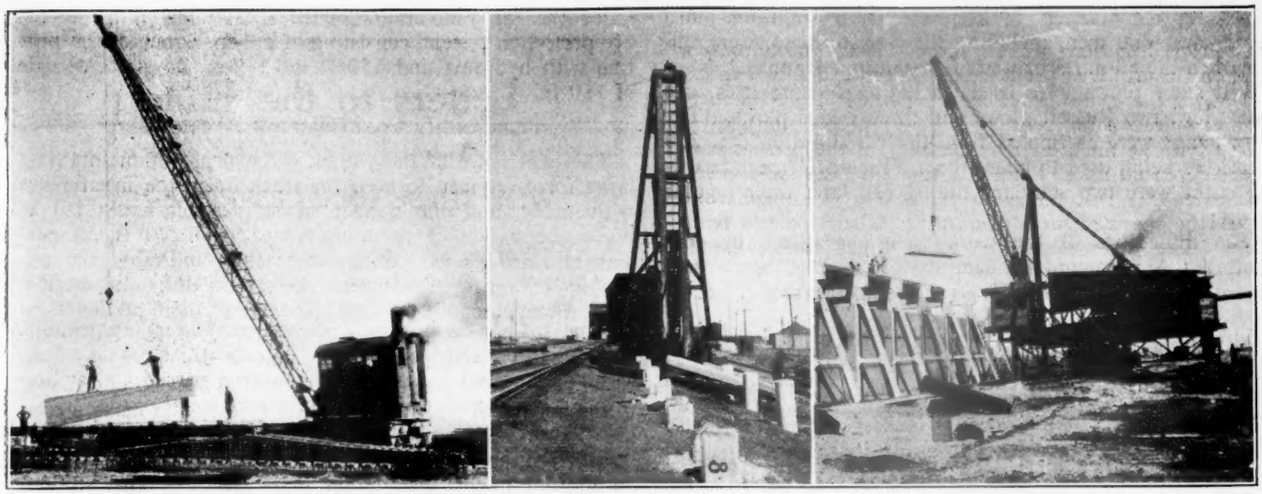
7. Road foremen and trainmasters chronically wink at infractions of unreasonable rules.

Therefore, the "stop and proceed" indication should be put in the scrap heap, and in its place there should be a permissive indication. Under such a plan the three aspects of a permissive signal would be "clear," "caution," and "extreme caution." No changes in present signals would be necessary.

Under such a plan surprise tests could be made as readily as now, and probably would be made more conscientiously. Discipline could be enforced as well as now, probably better, and business would be expedited.

The efforts that have been made to pull the teeth of the "stop and proceed" signal by using "grade" or "tonnage" permissive signals does not go far enough. The "stop and proceed" signal should be done away with altogether, except possibly in some very unusual locations.

A. M. Burt,
Chief Engineer of Maintenance of Way, Northern Pacific.

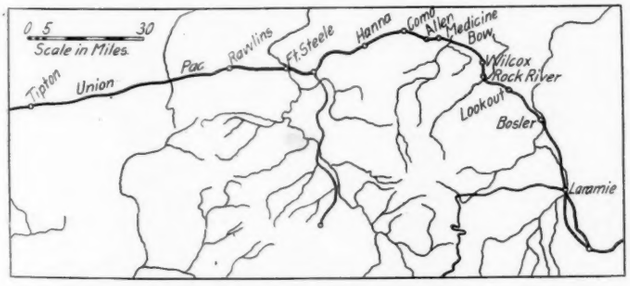


Handling Units with a Locomotive Crane. Driving Concrete Piles. Erect ing the Shed at Rock River with the Special Traveler.

Concrete Snow Sheds on the Union Pacific

A New Form of Construction Has Been Provided to Protect This Transcontinental Line Against Drifting Snow

SIXTY-MILE gales, continuing for weeks, swept snow across the wide stretches of rolling plateau west of Laramie, Wyo., last winter and caused repeated interruptions to the heavy transcontinental traffic of the Union Pacific in spite of the tireless efforts of the operating and maintenance departments. Trains were blocked so often by drifting snow while taking coal and water at Rock River, Wyo., that 1,200 ft. of timber snow sheds were built in the midst of the stormy weather under very trying circumstances to alleviate the conditions at that point. Altogether the experience of the winter surpassed anything previously encountered within the memory of the oldest employees and



Map of the Affected District

it is entirely possible that a like situation may not occur again in years. Nevertheless the management of the Union Pacific concluded that the demands for the uninterrupted movement of its trains are so great as to justify enormous expenditure for a permanent protection against these winter troubles. This decision led to the design and construction of reinforced concrete snow sheds, an entirely new form of protection against drifting snow.

The Winter of 1916-17

The trouble started about December 20, 1916, with the fall of 12 to 14 in. of snow. This was the heaviest snowfall of the winter and is a relatively moderate fall as compared with some portions of the country, but the conditions experienced last winter were at no time caused alone by the depth of the snow. Instead they were brought about by the almost incessant west and northwest winds which kept bringing fresh supplies of snow across the many miles of open country. The initial trouble occurred in the 18 miles between Rock River, Wyo., and Medicine Bow, and as the severity of the winter increased it was extended westward 20 miles to Hanna, and eastward 20 miles to Bosler. At one time snow troubles were experienced as far west as Tipton.

The condition encountered may be described as an almost steady stream of snow-filled air, traveling at velocities as high as 60 miles an hour, which formed deposits against any obstruction placed in its path. The snow in the air was all within about 60 ft. of the ground so that the sun was often seen shining in a clear sky overhead when conditions were at their worst. Under such circumstances the railroad cuts were the source of much trouble for even a standing train would stop so much snow that drifts would form around the wheels to a sufficient extent to block the train in the space of time occupied in taking water and coal. There were times when the track would become impassable three minutes after the passage of a snow plow.

Another peculiar phenomenon was the blowing of sand. At one time during the month of February six inches of sand, containing no small quantity of alfalfa hay, roots and all, was deposited on top of the snow drifts in White Rock cut, five miles east of Rock River.

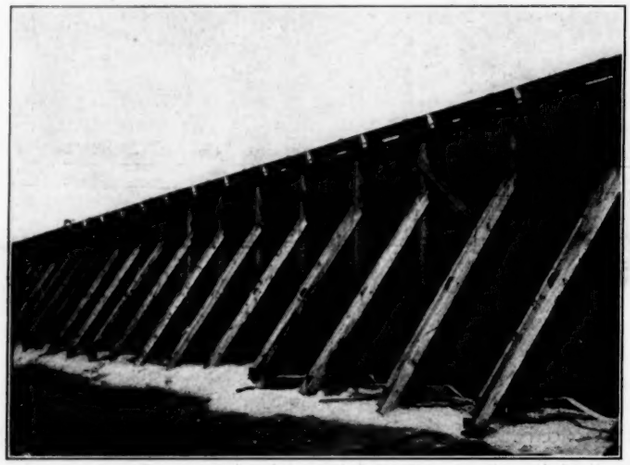
Railroad Makes a Hard Fight

The fight to keep the line open began after the snowfall in December and although no general tie-up of traffic occurred, it was necessary to continue the struggle for three weeks. Some additional snowfall with a renewal of the wind late in January called for renewed efforts, and with the gradual filling up of the cuts and the repeated passage of the snow plows, the difficulties were greatly increased so that the month of February was one long struggle. Portions of the line were blocked repeatedly for short intervals but there were only two general blockades, one of two days and another of three. However, it required increasing efforts with an ever-

increasing organization to keep the trains running, until finally over 800 men, including the section crews, were employed in the 50 miles between Lookout and Hanna.

Ten snow plows were used, including four rotaries, one Gull plow, two Russell plows and three wedge plows. The extra gangs were assembled from the various divisions, 200 bunk cars being used to house them. Included in the boarding outfit were two standard dining cars and their regular crews.

The difficulties of the work were aggravated by cold weather. A minimum temperature of 21 deg. below zero was attained and for six weeks the temperature did not go



Part of the Timber Snow Shed

above zero. The troubles with the standing trains at Rock River became so severe that it was concluded to commence the immediate construction of a timber snow shed covering the tracks each way from the coaling station.

Quick Work on Timber Snow Sheds

The character of the frame snow sheds is shown in one of the drawings, from which it will be observed that they are intended purely for protection against blowing snow. The roof trusses and the 8-in. by 8-in. posts which support them are spaced 12 ft. center to center along the track and are covered on top and on the windward side by No. 12 black corrugated iron, secured to 3-in. by 6-in. purlins. The winds causing the snow trouble were westerly (the line at Rock River runs north and south) so that it was not necessary to provide any protection on the east side. The structure was braced against collapse by a batter brace; but more dependence was placed on lines of ½-in. wire cable extending from every alternate bent to dead-men buried 50 ft. west of the west wall of the shelter. The shed covers three tracks, two main lines and a central passing track. The trusses directly above each track are protected from cinder blast by a strip of corrugated iron 6 ft. wide.

Twelve hundred feet of this form of shed was built during the severe weather in February. To as large a measure as possible, the material was prepared for ready erection before arrival at the work. The columns and bases and the trusses were framed at Cheyenne, 100 men being employed on this work, in addition to 100 men used on the erection. The sheds are supported on pile foundations, the piles being driven a sufficient time in advance to keep ahead of the erection work.

The construction of these sheds in this emergency required the accumulation of a large amount of material from all sources. This included lumber, hardware and corrugated iron, considerable quantities of the latter being shipped from the east in baggage cars. One feature of the shed that entailed the rapid accumulation of special material was the fire protection system, consisting of a 4-in. wrought-iron pipe line with hydrants and 150 ft. of 2½-in. hose at intervals of 150 ft.

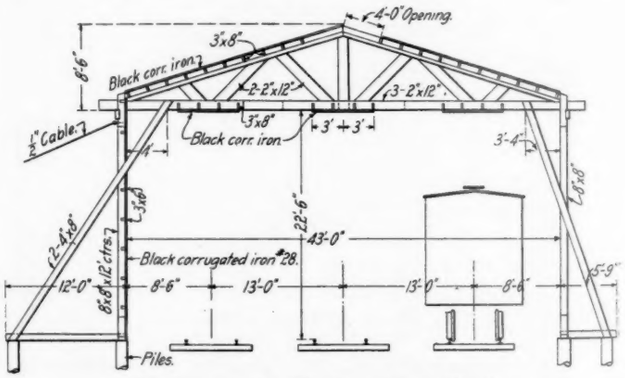
Permanent Construction Authorized

The experience of the winter, the expense of maintaining large forces of men to keep the track open, the interference with traffic and the danger of serious blockades led to the authorization of the construction of 8,270 ft. of permanent snow sheds. Subsequent study indicated the advantage of reinforced concrete, pre-cast in units and erected. Of the total amount of shed the largest single section is at Rock River, where there is a length of 4,441 ft. All of the timber shed constructed during the winter is retained in service except that the south 700 ft. was taken up and moved to the north end and it was further extended to make a total of 1,779 ft. The new concrete shed at this point extends south from the south end of the wooden shed as now located. In addition to this installation, there are three other sections of concrete sheds. One section of 500 ft. is on a 4-deg. curve at Sulphur Lake cut, between Allen and Komo, Wyo. Another section is 1½ miles west of Wilcox, Wyo., involving 1,500 ft. on a 1-deg. 6-min. curve. Another 1,800 ft. was installed on tangent track 1½ miles east of Medicine Bow.

In the last three named sections the shed covers only two main tracks, but at Rock River the west 500 ft. covers a center passing track in addition to the two main tracks, while east of this point the two main tracks are spaced wider than 13 ft. for a distance of 200 ft. in making the spread for the passing track. The situation is further complicated by the need of provision for a siding, branching off from the main track east of Rock River.

The Design

One of the drawings shows the standard design for two tracks, which is in reality a simple structure, consisting primarily of a succession of concrete bents or frames erected along the track every 15 ft. Each bent consists of two unsymmetrical A-frames, supporting a reinforced concrete girder spanning across the track. The space between the verti-



Section of the Timber Snow Shed

cal legs of the A-frame and between the tops of the girders is enclosed by reinforced concrete slabs. The clearance provided by this structure is ample, as indicated in the drawing.

The structure is designed to withstand a working load of 50 lb. per sq. ft. of wind pressure on the side wall and 50 lb. per sq. ft. of live load on the roof in addition to the dead load. Under a condition of no wind, the load of the structure is practically all carried on the vertical legs of the A-frames. The batter legs come into play under the condition of lateral wind pressure. The designing unit stresses for the concrete were 650 lb. per sq. in. maximum

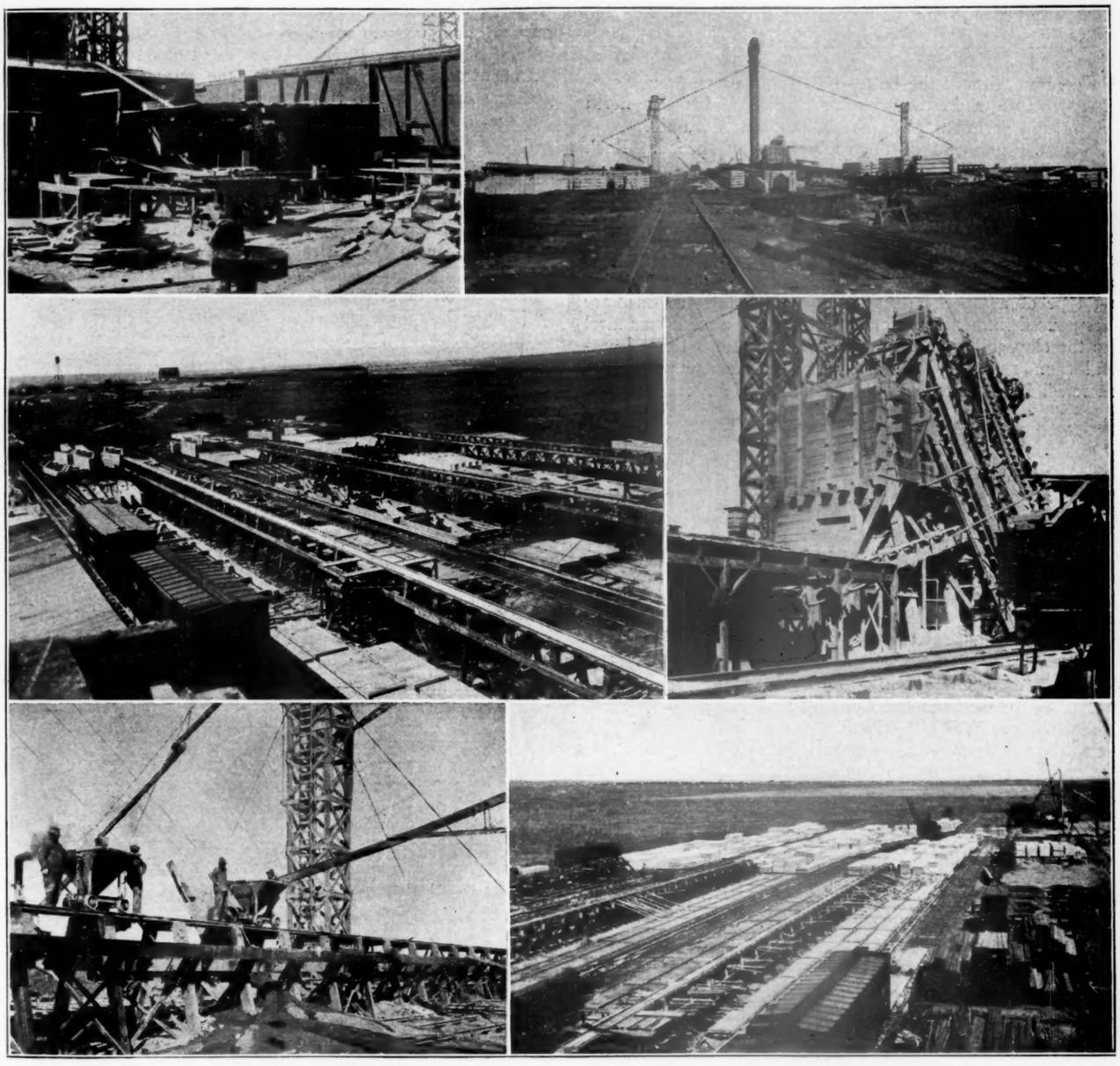
compression in flexure, 540 lb. per sq. in. compression under axial load and 40 lb. per sq. in. in diagonal tension. The working stresses in the steel were 16,000 lb. per sq. in. in tension and 9,750 lb. per sq. in. in compression.

Responsibility for the success of the design is due in a considerable measure to the details of the connection between the units, which afford adequate load-carrying capacity while permitting ready erection. The footings were fitted with pockets to receive the bottoms of the A-frame legs. Anchorage against overturning is provided by 1¼-in. bolts, set in the outside pockets and passing through a 2-in. pipe sleeve in a toe extension on the outside legs. Similarly two ¾-in. bars projecting from the top of the A-frame passed into 2-in. pipe sleeves in the ends of the girders as the latter were lowered into place. The joints between the uprights and the girders were further protected by lugs cast on the underside of the girders on both sides of girder bearings.

The sides of the A-frame columns perpendicular to the tracks are equipped with grooves to receive the ends of the side slabs as they were slid down into position from the top. The top slabs rest on the top surfaces of the girders and are prevented from sliding off by raised stops formed in the concrete of the girders.

Some Structural Steel Required

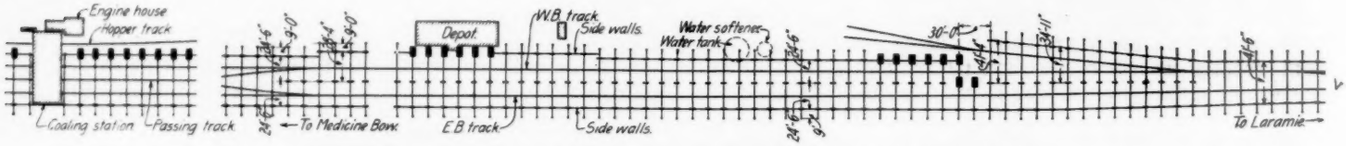
The additional tracks and the special track spacing covering part of the site of the shed at Rock River entailed the use of a large amount of special construction. Where the main tracks are spread a sufficient amount to secure the desired clearance, a row of columns was placed along the center line between tracks, but where the passing track occurs this was not permissible and a clear span of 48 ft. was required. The turnout for the side track east of the station required a maximum span of 41 ft. 4 in. Designs in reinforced con-



The Form Shop
The Pouring Yard
Spouting Concrete into Hopper Cars

The Concreting Towers
The Mixer Plant
Pouring Yard with Storage Yard in the Distance

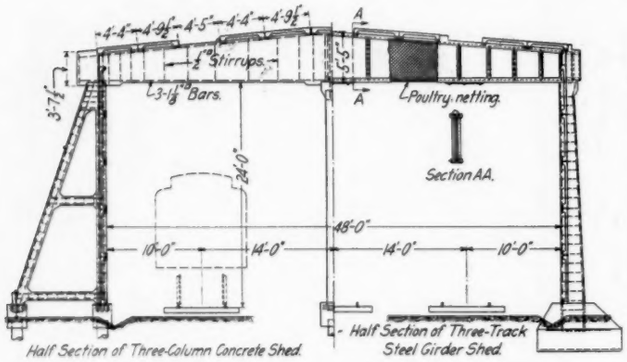
crete for these longer spans called for girders of such proportions that it was decided that structural steel girders covered with concrete mortar reinforced with poultry netting would be more practicable. One of the drawings illustrates this form of construction. Another special detail is the use



Ground Plan of a Part of the Concrete Snow Shed at Rock River, Wyo.

of a column without the batter post for a part of the three-track structure where the presence of a track along the north side did not permit the use of the standard A-frames.

About 75 per cent of the concrete snow sheds at Rock river and all of the sheds at the other sites are supported on natural foundations. For the other 25 per cent at Rock river the tracks are on an embankment so that piles were necessary to reach solid ground. Soil conditions precluded the use of untreated timber so concrete piles were used in lengths of 15 to 30 ft. These piles were largely of the precast type of a tapered square section. A few cast-in-place piles poured into cavities formed by driving a naked mandrel into the clay soil were also used. The footings for the natural foundations and the caps for the concrete piles were concreted from a mixer set up alongside the track, using



Half Sections of Two Types of Special Construction

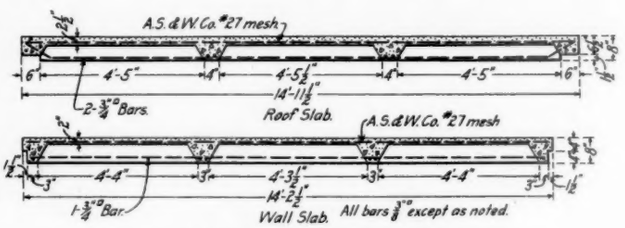
temporary runways between and across the tracks to reach the sites of the various footings.

Units Manufactured at a Central Plant

All of the unit concrete was cast in a plant installed by the contractor at Rock river. The project entailed the casting of 12,300 cu. yd. of concrete in 10,313 units, or an average of only 1.2 cu. yd. per unit, so that the problem was not alone in the manufacture of a large yardage of concrete but in the handling of a great many units of relatively small size. The shortage of labor pointed to the need of a maximum use of labor saving machinery. The concrete was a 1-2-4 mixture, using sand from Fort Steele, Wyo., gravel from Salt Lake City, Utah, and from Denver, Colo., and cement from Devils Slide, Utah. Hydrated lime to an amount equal to five per cent of the cement was used to increase the plasticity of the concrete for spouting. Including the concrete in the piles and the footings a total of 20,000 cu. yd. of concrete was poured.

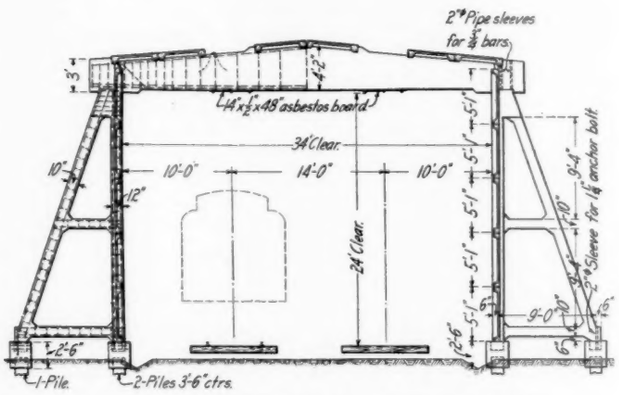
The concrete plant covered a large rectangular area served by a grid of tracks placed parallel to each other and from 50 to 80 ft. apart. The mixing plant occupied the center of the site between the two middle tracks which were used for the delivery of materials, while the concreting and curing yard occupied the rest of the area on either side of the mixing plant. Concrete mixed by two 22-cu. ft. cube mixers was hoisted up a duplex tower 132 ft. high, from which it was spouted to two auxiliary towers 82 ft. high on either side. From each of these in turn the concrete was spouted to hopper cars standing on narrow-gage tracks occupying frame trestles about 10 ft. high which were located parallel to and about half way between the various tracks serving the yard. These hopper cars delivered the concrete to any part of the yard and spouted it to the forms.

The average output of the concrete plant was from 200



Details of the Slab Units

to 250 cu. yd. per day. All concrete materials were handled mechanically. Sand and gravel were delivered on cars alongside the mixer house in bottom-dump cars so that they could be emptied into two track hoppers. From these the materials were elevated by two belt bucket hoists to separate bins above the mixer. All of the gravel passed over a grizzley so that stones over-size could be separated and passed through a No. 2 Gates gyratory crusher and dumped back into the track hoppers. The mixer house bin and the sand and gravel hoist are shown in one of the photographs. A 16-in.



Cross Section of the Standard Two-Track Shed

conveyor belt on which the cement and hydrated lime were carried from the cement storage to the charging floor of the mixer hoist is also shown. The handling of the cement was also facilitated by the use of a belt unloader for the removal of the bags of cement and lime from the cars.

The forms were built in a yard located close to the mixer plant so that lumber could be delivered on either of the material tracks and also to facilitate the operation of the saws and planers from the steam engine operating the concrete

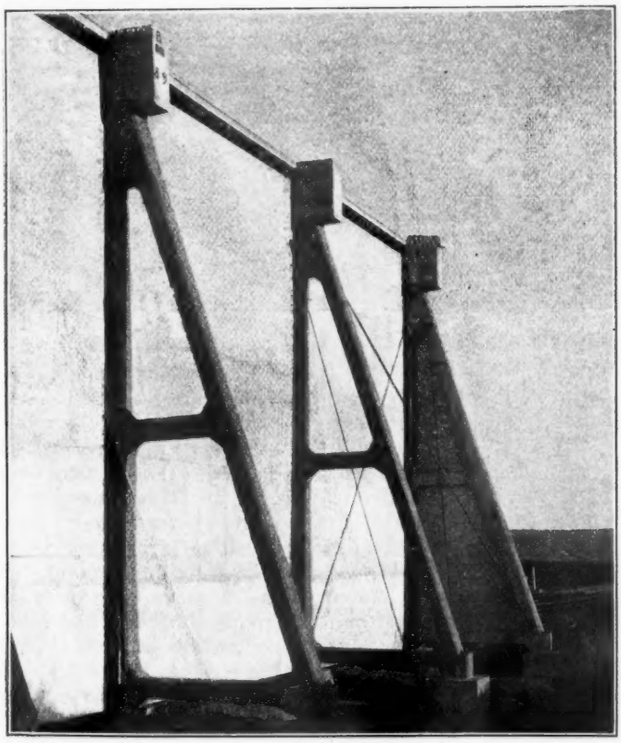
plants. All parts of the forms were cut to templets and put together on assembling tables, thus eliminating all measuring after the pattern form had been made for each style of concrete unit. The forms were oiled preparatory to each pouring of the concrete with a paraffin base oil.

The reinforcement consisted of No. 27 triangular mesh in 54- and 56-in. widths, ¼-in. plain rods and corrugated bars of various sizes. A set of tinsmith's rolls were used to flatten out the rolls of wire mesh. A line from a hoisting engine served to pull the mesh through the rolls and onto a long table, where it was cut into the desired lengths with hand shears, cleats nailed to the top of the table serving as guides for the cutting.

Although the unit character of the work called for the use of a great many bars of equal length, the conditions of the steel market made it imperative to order the bars, of which 1,500 tons were required, as soon as the plans were at a stage to give an approximate idea of the requirements. Obviously the exact bills of bars were not ready at that time and in consequence stock lengths were ordered, thus requiring the bars to be cut to special lengths in the field. The reinforcement for the various units was assembled into complete "cages" before placing in the forms. They were supported clear of the bottom forms by means of small blocks of concrete prepared for the purpose. For the larger units it was necessary to handle the assembled reinforcement with locomotive cranes.

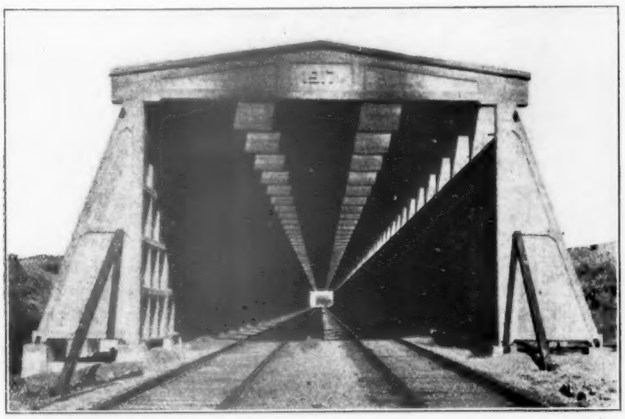
An Accurate Record of the Units Was Kept

The manufacture of a large number of units of various kinds, their storage for a sufficient time to insure proper curing, the delivery of the units as needed for erection, the delivery of the units broken in handling and other contingencies arising requires the formulation of an efficient system of accounts covering all operations on the units from the time that they were cast until they were erected. The concreting yard was divided into sections containing a definite number of forms of the various classes and this number together with the class mark of the unit in any given section of the yard was noted on a sign board nailed to the side of the hopper car trestles for identification. As fast as the units were cast they were marked with the class number and the date of pouring.



An Exterior View

Three separate records of the units were kept in the superintendent's house in the cement storage building close to the mixer. Blueprints of the erection diagram, showing the position of each unit in the four sections of shed, were marked up as each piece was concreted. A large chart mounted on the wall served as a record of the number of units cast each day, the total number concreted to date and the amount of material used. In addition to this there was a storage yard diagram containing a record of the date on which the units were cast and the date they were shipped for erection.



South Portal of the Concrete Shed at Rock River, Wyo.

The wall and roof slabs were removed from the forms and placed in the storage yard after three days and the girders and columns after seven days. All units were cured in the storage yard at least two weeks before removal for erection, and were kept moist by sprinkling during the entire period. Five locomotive cranes were used for the various lifting operations in the concreting and curing yards. The spacing of the tracks and the hopper car trestles was such that the cranes could readily pick up loads placed anywhere within the yards. Two switch engines were in service daily, handling material and hauling the units to storage or to the point of erection.

Two Erection Methods Used

The general methods of erection were adopted. At Rock river the erection equipment consisted of a special stiff-leg-derrick with a 96-ft. steel boom on a triangular steel frame equipped with rollers. The machine was rolled on blocking on the north side of the tracks at a sufficient distance to clear the tracks and structure. A temporary track was built in the path of this derrick for the delivery of the units on cars. A photograph shows this derrick in the operation of setting one of the roof slabs. The length of the boom was sufficient to permit the erection of 60 lin. ft. of shed from a single set-up and the speed of erection was such that the derrick was shifted about once each day.

At the three other snow sheds, all of which are located in cuts, the erection was carried on by the use of locomotive cranes. One crane operation on a track over the side ditch in the cut and clear of the main track erected the A-frames and wall slabs for one side, backing away as the work progressed. A larger crane with a 70-ft. boom operating on a "high line" on the natural ground on the opposite side of the cut erected the A-frames on the opposite side of the shed as well as the cross girders. The first crane was then trans-

ferred to the "high line" and erected the remaining side wall slabs and the roof slabs. The smaller crane erected about 300 ft. of A-frames and side walls per day.

The joints between all units of the structures were treated with cement mortar or asphalt or a combination of the two. The beds of the A-frames in the footing, of the girders on the columns and of the roof slabs on the girders were covered with a layer of cement mortar before the units were placed. The longitudinal joints between the roof slabs were closed with mortar but the transverse joints in the slabs over the tops of the girders were filled with asphalt. This material was also used in the joints of the side wall slabs in the grooves of the columns. To facilitate the placing of this filler the slabs were held in exact position in the grooves by means of wedges until the edges of the joints on both sides were closed up with cement mortar to form a dam that would hold the asphalt poured in from the top. All of the mortar used was tempered with hydrated lime to make it work better on the trowel.

Interior of the Shed at Rock River

The work on the reinforced concrete sheds was commenced on May 20, when the contractor moved in his equipment; by August 6 the plant had been completed and forms had been built so that the concreting could be commenced. The erection of sheds was started on August 20. From 350 to 400 men were employed on the work. Eighty men on the forms; 30 on each mixer and 20 for each erection gang comprised the principal units of the force. One rather unusual arrangement of the contract was that the railroad company boarded the contractor's men.

The reconstruction of the wooden sheds was carried on by company forces. Besides shifting the sheds further north and the construction of about 500 ft. in addition, this work included fire protective measures, that is, the covering of all of the truss members with cement mortar placed on expanded metal lath.

The entire project has been carried on under the direction of W. R. Armstrong, engineer maintenance of way of the Union Pacific. The designs were developed and the plans prepared under the direction of W. L. Brayton, bridge engineer of the Union Pacific, and the construction was under the supervision of L. W. Althol, resident engineer. The Houghton Construction Company of San Francisco was the contractor.

HOW CAN WE DO THE SAME AMOUNT OF YARD WORK WITH FEWER MEN?

By S. W. Wherry

Yardmaster, Pennsylvania Railroad, Altoona, Pa.

The indications are that the railroads as well as the other industries are going to face a shortage of men this winter, which with reference to the men in train service, is going to interfere seriously with commerce. This being so it would seem that the only thing to be done is to get more service out of the men we have. While this can possibly be done to some degree with men in road service, it is in the yards that it can be carried out to the fullest extent, this being especially true with men engaged in classification work—usually the major portion of the yard forces.

It is generally the case that where car riders are averaging two and one half cuts per hour, or twenty cuts in eight hours, and they see that they can benefit by riding more runs in order to finish a train in time to get an "early quit," or the last train in the yard is being shifted and there are prospects of a "flat," they will speed up to three or three and one half cuts per hour, but to do this requires every man connected with the operation to keep hustling and under present methods it cannot be done all the time regardless of the efficiency of the supervision, unless the men have some object in view for which to work. It is evident that the only way to get a man to do all he can, instead of all he has to, is to give him some incentive to work for and to reduce the amount of energy he is required to expend doing things which bring no return.

A number of methods of increasing the number of cuts handled per man per day at the classification humps have been tried out in almost every yard in the country without any great amount of success. Probably the most satisfactory is that of having a check clerk stationed at the hump keep a record of the time each man leaves the hump and returns to it, imposing discipline for consuming unnecessary time,

but this method, like many others only provides for the punishment of the men who do not do the average amount of work and does not provide for rewarding the men who do more than the average. If a man is dropping a car into a classification yard and he sees that by holding the car up just a little he can arrive in time to miss the pick-up on the return trip, it would not be human nature for him not to do so in nine cases out of ten, unless it is to his advantage to catch that pick-up.

Under present conditions the suspension of a man is more of a penalty to the railroad company than it is to the man, and it is my experience that the only reliable incentive for a better effort in a man is the effect it will have on his pocket book, so that under the present labor conditions the best way to get the car dropper to increase his average work is to pay the established rate for a day's work and then pay a bonus for all cuts over a predetermined number ridden by a man in a day. This bonus should be the average amount paid per cut for the predetermined number. It should be arrived at by taking the average number of cuts per man at that point for a six months' summer period from May until November, and a six months' winter period from November until May, the averages to be used as bonus bases during these periods.

One of the objections to this scheme is that the men assigned to classification crews would likely object to doing necessary work other than riding runs, but this could be overcome by giving credit for cuts for the time he was engaged in other work in proportion to the average time required to drop a car into the yard and return to the hump at that particular point.

Another objection might be that the men would not drop their cars against the other cars on the classification tracks in order to get back to the hump quickly, but as this would be such a disadvantage to the men on account of the delay while cars were being backed down, I do not think it need be considered.

Of course it might result in reckless car riding and resultant damage to equipment; this would have to be overcome, possibly cutting the men who are responsible for damage out of the bonus privilege for a stated period, thus taking the incentive away from reckless riders.

The greatest benefit to be derived from the system would be that the car riders would likely raise very strenuous objections to any unnecessary delay which would cut down their bonus earnings and would tend to keep other employees working in connection with hump operations "on their toes."

When I refer to energy expended by car droppers for which no return is received by the railroad company I mean that which is used by the men in crawling across cars standing on the classification tracks to reach the pick-up track, in walking to the hump where there is no pick-up service or where the pick-up does not run the entire distance to the hump, and by reshifting cars which have been improperly classified.

It requires considerable more time and effort for a man to return to the hump after having ridden a car into the classification yard, than it does to ride the car down, as it is necessary to get up and down off the cars on from one to a score of tracks, depending on the size of the yard and the positions of cars on the various tracks. To overcome this useless expenditure of energy a better pick-up service must be installed. Unfortunately, it appears that when a majority of classification yards were laid out the main thought was in getting the cars down into the yard and very inadequate facilities were provided for getting the men back. About 50 per cent of the yards have the pick-up track on the first track leading off the ladder track instead of on the last, so that if a man takes a car on to any track he must cross cars to get to the pick-up track, whereas if the pick-up track ran along the ladder track the men taking a considerable number of the cuts into the yard could cross the upper ends of the tracks to the pick-up track. If I had the designing of new classification yards I would provide subways under the yard to reach from one side to the other, about fifteen or twenty car lengths apart and with openings between every other track, so that a man would never have to crawl over a car to get to the pick-up and would not have more than eight or ten car lengths to walk to get to the subway.

However there is no time now to rebuild yards but I believe that a better arrangement of pick-up facilities could be made in a number of yards, and where the size of the classification yard warrants, two pick-ups could be used to advantage. This would perhaps be an expensive arrangement if locomotives were used for both pick-ups but by substituting gasoline, or electric storage battery motor cars the expense would be reduced. There does not seem to be any doubt but that the gasoline motor car should make an efficient, economical pick-up car, but the cars which I have seen used at various points for this work are small two-cylinder affairs which were built for entirely different service. When it is figured that in the average yard a pick-up makes an average of eight one-mile trips each hour with a load of about 12 men and keeps this up for 24 hours a day it would seem that a specially designed car would be required, with an engine of about the same capacity as a 3000-pound commercial truck.

In my estimation one of the good features about a gasoline motor pick-up car is that the assistant yardmaster or conductor in charge of the hump operations cannot use it for other purposes as he can a locomotive. The use of the pick-up engine for other work, unless it is absolutely necessary, is one of the most expensive things which can be done at a classification hump.

Overcoming the reshifting of cars improperly classified is a considerable task and there seems to be no efficient remedy for it, as it is almost impossible to keep all the cuts far enough apart on the ladder track to throw the proper switches and the levermen are very apt to make mistakes or lose cars on the ladder. However a little better cooperation between scale forces and yard forces at classification yards situated at scales would doubtless avoid some of this work, while a campaign of education should be conducted with the minor officers in charge of yard work so that judgment would be used in deciding whether it is not better to leave the car in the wrong classification and notify the man in charge of the despatching work to have a make-up crew shift the car out at the despatching end, which would probably take a crew consisting of one engine and three trainmen 20 minutes, rather than hold up a classification crew, consisting of two or more engines and from 15 to 20 men, 8 or 10 minutes.

If blocked receiving yards are to be avoided this winter it is time something was done to secure more efficient service from the men we have; and as the bonus system would not increase the cost of handling cars over the humps, although it would increase the individual earnings of the men, I believe that it is one solution of the problem. Under present conditions a man can easily get another position if he loses the one he has, and the old system of discipline reacts to the disadvantage of the railroad company. Strict supervision and penalizing have lost their effect, and we must try something different.

RAILWAYMEN AND AIR RAIDS.—Delegates from the National Union of Railwaymen in the London district have recommended legislation to place railwaymen who are killed or injured during air raids on the same footing in the matter of pensions as sailors and soldiers.

NEWLANDS COMMITTEE HEARING

The Newlands Joint Committee on Interstate Commerce on December 20 concluded its series of hearings begun on December 10 for the purpose of receiving the testimony of state railroad commissions, and adjourned subject to the call of the chairman.

A substitute both for government ownership or operation of railways and for the present system of private ownership of competing corporations was proposed as a solution of the railway problem by Ex-Senator Joseph L. Bristow, the concluding witness before the committee. Mr. Bristow is chairman of the Kansas Public Utilities Commission and chairman of the legislative committee of the National Association of Railway and Utilities Commissioners, but explained that this proposal represented only his personal views.

Mr. Bristow proposed, as a method of eliminating the evils resulting from private competition, a merger of all the railroads of the country under government supervision by the organization of a national bureau or corporation with directors appointed by the President, to acquire the railroads as a trustee by issuing stock, and that the Interstate Commerce Commission should be directed by law to prescribe rates sufficient to guarantee a dividend of from 4 to 6 per cent on the stock after payment of operating expenses. The separate organizations of the railways under his plan would thus be gradually eliminated so that the strong roads would sustain the weak roads. The operating officers would be appointed by the government directors, but there would be no necessity for taxation, he said, either to pay for the roads or for their operation, and the government guarantee would take nothing out of the treasury because it would be provided for in the rates.

"This stock should have no voting power," Mr. Bristow said, "and would not be a government obligation but an obligation on the railroad property itself. I don't think there could be any greater security. There would be none of the evils of competition and the strong roads which now do not need any increase in rates would sustain the weaker roads which now cannot be given rates that would give them an adequate return without swelling the earnings of the roads already earning a fair return. I don't think you can remedy the defects of the existing system without changing the system. The operation of the railways is all right now. The difficulty comes when the revenues are not enough to satisfy the bankers that control them. This would give us common ownership. I am not in favor of government ownership. I do not believe the government ought to buy the railroads and pay for them by taxation nor do I believe in taxation to pay for their operation. It would be too easy to levy a tax in case there should be a deficit from government operation."

As a basis for determining the value of the railroads under this plan, Mr. Bristow suggested taking the average market value of their stocks and bonds for a period of five years. This, he said, represents what the investor has considered the railroads' worth. As an alternative plan, he said, the valuation can be determined by waiting until the Interstate Commerce Commission has completed its valuation.

"I would not have the railroads operated by government officers," he said. "I am afraid government ownership and operation would be disastrous. Under my plan the political power of employees might be increased, but I doubt if it would be as great as it is now because their interests would be balanced against those of the shippers and the public. I think the public would always be willing to pay rates sufficient to pay good wages." He suggested that there is now rather a strong tendency on the part of the public to be indifferent to the merits of a wage controversy because it assumes that the higher wages would come out of the pockets of a few rich men.

Mr. Bristow began his testimony by introducing a table prepared by J. P. Norton, a bond expert, giving the market prices and yields of the stocks and bonds of 20 railroads since 1890. This showed, he said, that the credit of the railroads has been good and if it has recently declined it has been rather due to the campaign of publicity conducted by the railroads depreciating their own financial condition rather than to any action of the state commissions.

Mr. Bristow said he would favor federal regulation of security issues provided the states should have the right to be heard and heard effectively in matters in which the people of a state are more interested than the nation at large. He objected to exclusive federal regulation of rates, saying that the state commissions can adjust many minor local complaints promptly and with knowledge of local conditions, which it would be too expensive to take before the Interstate Commerce Commission.

Federal officers, he said, would not be so close to the people and would not enjoy the confidence of the people to the same extent as state officers. Regional commissions having jurisdiction only over interstate matters he thought would be desirable.

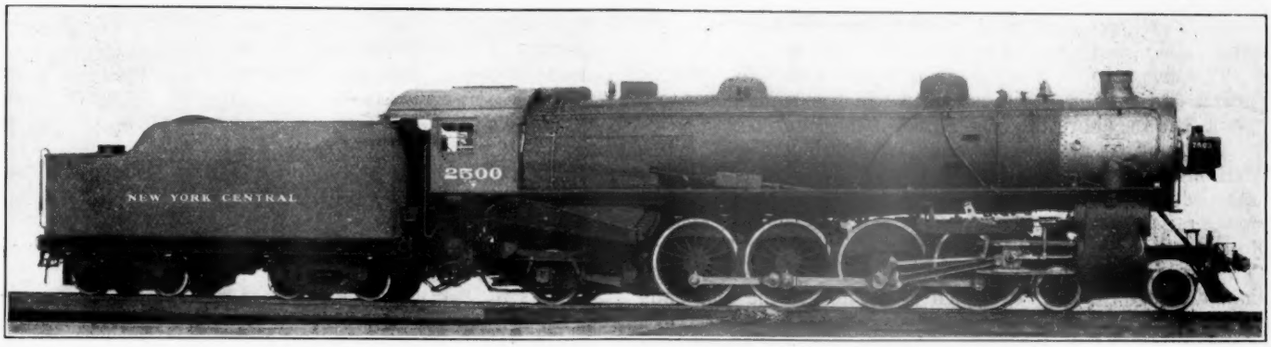
In reply to questions by Representative Sims, Mr. Bristow said he would not change the present system of railroad taxation by the states, but he did not think railroad property should be taxed twice, once as property and again in the form of a tax on securities. He thought comparatively few states had that form of taxation.

Senator Newlands remarked that another senator had told him that there was almost no investment in railroad securities by people in his state because they are subject to taxation at such a rate that only tax-dodgers can afford to own them.

Mr. Bristow also said that state commissioners have been made "the targets for railroad press agents" and that they have been "much embarrassed" by railroad publicity. The Kansas commission has no publicity agent, he said, but has recently adopted the plan of issuing a bulletin which is sent to newspapers, for the purpose of showing what the commission is doing. He presented a copy of this bulletin which contained a reply to a magazine article which it declared misleading and also contained articles commenting on the "prosperity" of the railroads.

While Mr. Bristow said this bulletin is published for the purpose of informing the people of the activities of the commission, the copy he presented contained one page devoted to a list of hearings and orders issued by the commission, while the remaining three pages were principally devoted to other matters. One article was devoted to showing that 1917 was a good year for western railroads by comparing the 1917 figures with those of 1915. There was another long article on "Industry Suffering From Lack of Cars." One page was devoted to the editorial referred to and an article to show that the Missouri Pacific "is prospering now."

Improving Port Facilities in East Africa.—The port of Lourenço Marques, one of the best in southern and eastern Africa in its wharf accommodations, is being made better able to serve a greater number of steamers than formerly. Arrangements have been made by agreements between the Portuguese Railway administration and the South African Railways whereby the facilities for transporting coal from the Transvaal collieries to Lourenço Marques will be increased about double the amount of present tonnage. This will be brought about by pooling the engine power of the two railway systems and by reserving certain trucks for coal traffic only. The Lourenço Marques Railways have recently added three new American locomotives of the Santa Fé type to its engine power.—*Commerce Report.*

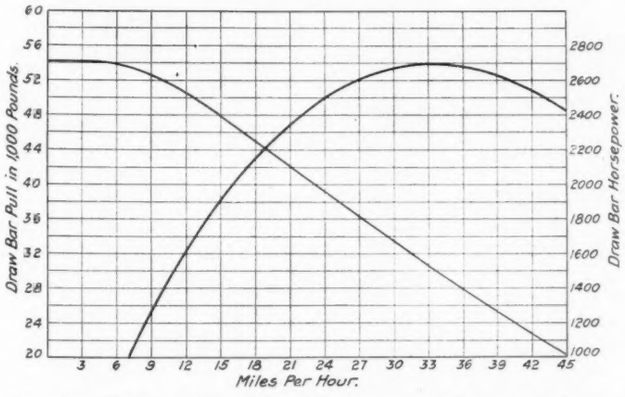


New York Central 4-8-2 Type Locomotives

First of This Type for Freight Service; Requirements Are High Sustained Capacity on Low Grade Line

ABOUT one year ago the New York Central received from the American Locomotive Company an order of 30 locomotives of the 4-8-2 type, which in several respects are the most notable locomotives of this type yet to be built.

Heretofore locomotives of this wheel arrangement invariably have been built to handle heavy passenger trains over mountain grades under conditions making difficult the maintenance of schedules with Pacific type locomotives. Locomotives of this wheel arrangement have therefore come to be known as the Mountain type. On the New York Central, however, the 4-8-2 type locomotives have been built for freight service on a line with comparatively few grades, on which, to an unusual extent, car limits determined by operating conditions and facilities other than motive power are the determining factors in the length of trains. The type name generally applied to these locomotives is obviously a misnomer in this case and these locomotives have therefore been styled the "Mohawk" type on the New York Central, after the name of the division upon which they were first placed in service.



Drawbar Pull and Drawbar Horsepower Characteristics of the N. Y. C. 4-8-2 Type Locomotives; Boiler Pressure 200 Lb. per Sq. In.

It will be noted that the average load per pair of driving wheels in the case of the 4-8-2 engines has been kept well within 60,000 lb., and they have been designed to take curves up to 19 deg. With their well designed reciprocating parts they should cause little difficulty in the maintenance of track.

Tractive efforts developed at the various speeds and the corresponding drawbar horsepowers are exhibited by the drawbar pull-speed chart, plotted from results obtained in dynamometer car tests with a steam pressure of 200 lb. per sq. in. It will be noted that the tractive effort of the locomotive is well sustained at the higher speeds.

On the basis of Cole's ratios, these locomotives should develop a maximum cylinder horsepower of 2,683 at a piston speed of 1,000 ft. per minute. In determining the ratio of boiler capacity to maximum cylinder demand, Cole's ratios are based on a steam consumption of 20.8 lb. per indicated horsepower-hour for superheater engines, and the grate is proportioned to burn four pounds of coal per indicated horsepower-hour at a rate not to exceed 120 lb. per square foot of grate area per hour. On this basis of comparison, the evaporative capacity of the boiler is equal to 98 per cent of the maximum cylinder demand, while the grate area is proportionately slightly smaller.

The boiler is of the conical type with an outside diameter of 81 7/16 in. at the first ring. The engines as originally built carried 185 lb. but the boilers were designed to carry a working pressure of 200 lb. and the pressure has been raised to 190 lb. per square inch since the engines went into service.

It will be seen that instead of the usual type of rod braces at the front and back heads, the heads of the boiler of the "Mohawk" type locomotives are braced with gusset sheets, the ends of which are bolted between angle bars forming the flanges for attachment to the boiler head. Where attached to the roof sheet the back head braces are flanged to conform to the curve of the sheet, while each front gusset sheet is bolted to the radial leg of an angle bar which forms the flange for securing the brace to the boiler shell. The longitudinal seam of the dome course is on the top center line, directly under the dome. It is of the butt joint type with inside and outside welt strips and the butt joint is welded throughout the length of the seam. The dome is of pressed steel formed in one piece and the flanges are extended in strips 13½ in. and 14 in. wide respectively, in front of and back of the dome, to form the outside welt strip of the barrel seam. The inside welt strip is bifurcated at the dome and forms the reinforcing pad under the dome flange.

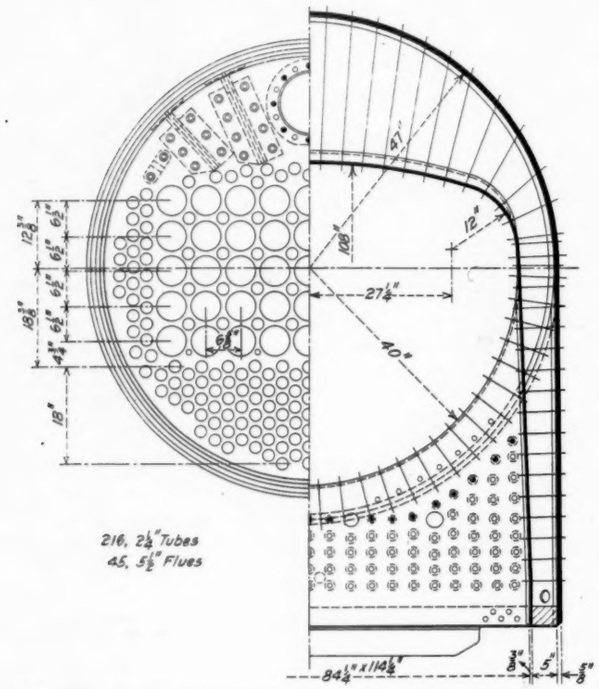
There are no unusual features in the firebox construction. It is fitted with a Security brick arch carried on four tubes three inches in diameter and has a barrel combustion chamber which extends forward into the barrel of the boiler 40⅞ in. beyond the firebox throat sheet. The tubes and flues are 21 ft. 6 in. long, measured over the tube sheets. As built, the

locomotives are hand-fired through two firedoor openings which are closed with air-operated firedoors.

The front end arrangement includes a 6¾-in. exhaust nozzle and a 19-in. stack extension which extends down to a point 3¾ in. above the center line of the smokebox.

The main frames and the single front rails under the cylinders are cast in one piece on each side. The top rail over the pedestals has a section 6 in. wide by 7 in. deep. The lower rails are 4½ in. deep at the smallest section, increasing to a depth of 5¼ in. over the ends of the pedestal binders. The rear frame and back deck plate are an integral steel casting, the forward ends of which are bolted to the rear ends of the main frames. The radius bar fulcrum, the pockets for the rear ends of the trailer springs and the trailer equalizer bar fulcrums are all an integral part of this casting.

With the exception of those for the main pair of drivers,

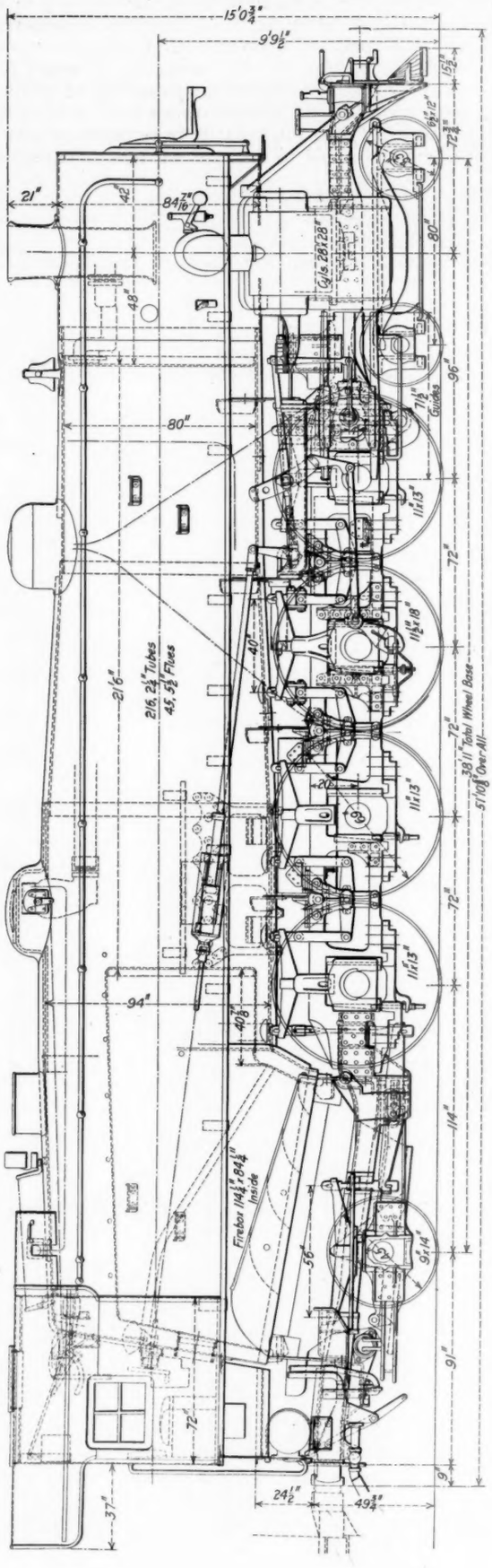


The Tube Sheet Layout and Section Through the Firebox

the driving journals are 11 in. in diameter by 13 in. long. The journals of the main drivers are 11½ in. in diameter and 18 in. long. Except for their length, the driving boxes used on this axle are similar in construction to those ordinarily used where the center line of the driving box and the center line of the frame coincide. The main jaws are widened by the use of steel castings which are bolted against the inside face of the pedestals. These castings also perform the function of frame crossties. By the introduction of offset cross equalizers in the spring hanger system at either end of the main driving springs, the position of the main springs has been moved in so that they are located directly over the longitudinal center line of the driving boxes. Each spring rests in a saddle of the usual type designed to clear the offset position of the frame rail relative to the center line of the box.

Steam is admitted to the valve chambers through an outside dome connection type of throttle valve and distributed by 14-in. piston valves having a travel of 7 in. The valves are operated by the Walschaert valve gear, fitted with the Ragonnet power reverse gear.

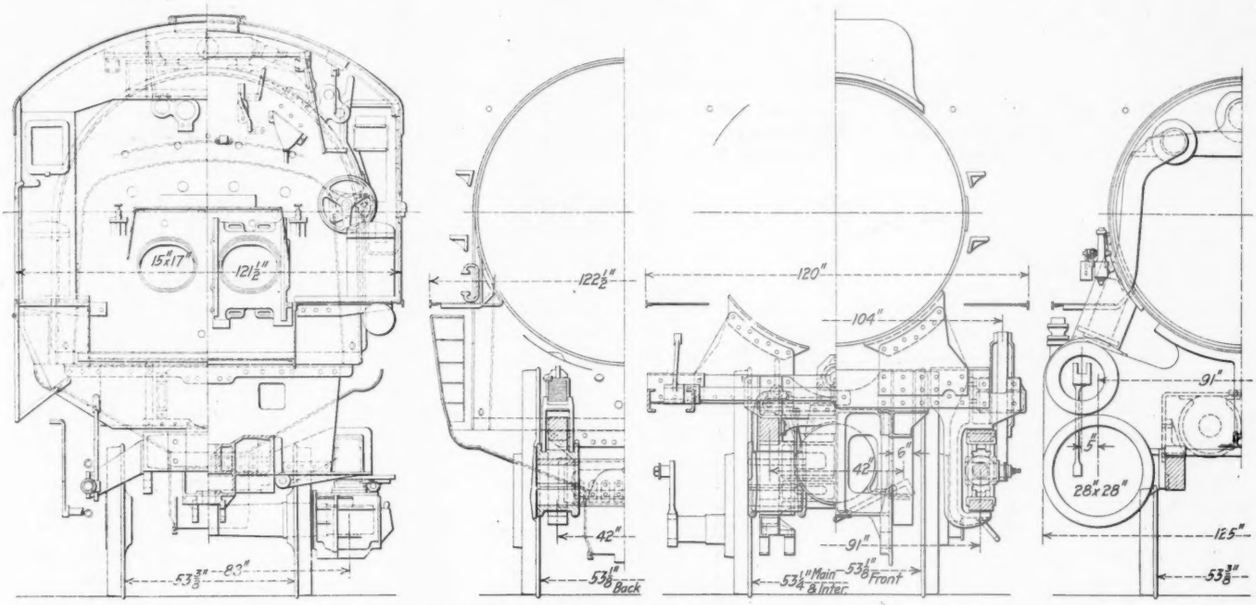
The engines are fitted with Woodward engine trucks and Cole radial trailing trucks. The engine truck has a swing of 4¼ in. on each side, and the swing of the trailing truck is 5¼ in. on each side.



Elevation of the New York Central 4-8-2 Type Freight Locomotive

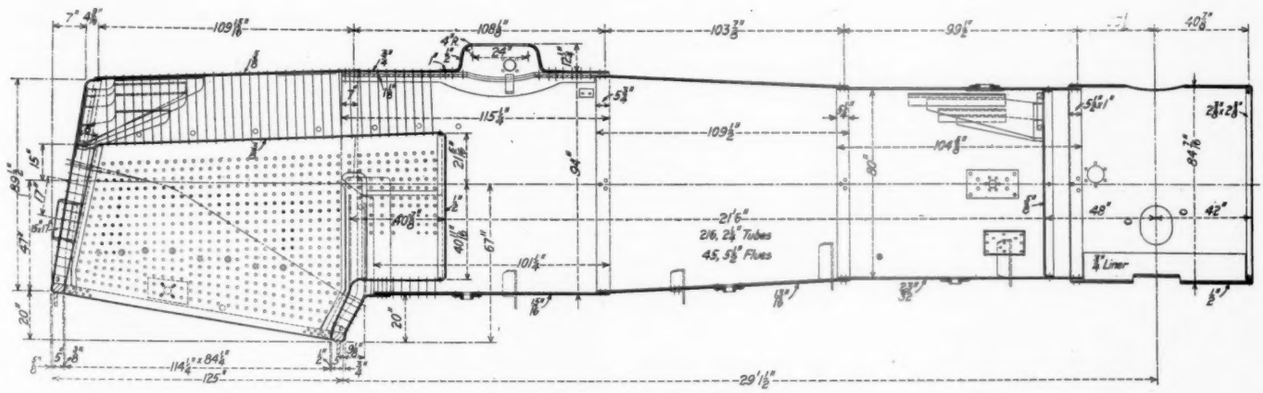
It is evident that the development of the full capacity of a locomotive capable of delivering 2,600 indicated horsepower with a coal consumption of approximately three pounds per horsepower-hour, thus requiring the combustion of about 7,800 lb. of coal per hour, is beyond the possibility of attainment by hand firing. As the locomotives are hand fired, they have never developed their full capacity in regular road service. They have been able to decrease the time required to handle tonnage trains over the division, and in fast freight service they handle actual tonnages of from 2,500 to 3,500 tons, in adjusted tonnage trains of 75 to 95 cars, over a division 139 miles long in from five to eight hours' total time on the road. The engines have been built so that stokers may readily be applied whenever traffic conditions require the employment of their total horsepower capacity. In the mean-

Weight on leading truck	52,500 lb.
Weight on trailing truck	56,500 lb.
Weight of engine and tender in working order	509,500 lb.
Wheel base, driving	18 ft.
Wheel base, total	38 ft. 11 in.
Wheel base, engine and tender	72 ft. 9 in.
Ratios	
Weight on drivers ÷ tractive effort	4.6
Total weight ÷ tractive effort	6.7
Tractive effort × diam. drivers ÷ equivalent heating surface*	567.6
Equivalent heating surface* ÷ grate area	93.5



Cross Sections of the New York Central Locomotive

Firebox heating surface ÷ equivalent heating surface,* per cent	5.1
Weight on drivers ÷ equivalent heating surface*	37.5
Total weight ÷ equivalent heating surface*	55
Volume both cylinders	20 cu. ft.
Equivalent heating surface* ÷ vol. cylinders	312.4
Grate area ÷ vol. cylinders	3.3
Cylinders	
Kind	Simple
Diameter and stroke	28 in. by 28 in.



Sectional Elevation of the Boiler

time advantage is being taken of the more efficient combustion obtained under the conditions of hand firing.

The principal dimensions and data are given in the following table:

General Data	
Gage	4 ft. 8½ in.
Service	Freight
Fuel	Bit. coal
Tractive effort	51,400 lb.
Weight in working order	343,000 lb.
Weight on drivers	234,000 lb.

Valves	
Kind	Piston
Diameter	14 in.
Greatest travel	7 in.
Outside lap	1 in.
Inside clearance	0 in.
Lead	¼ in.
Wheels	
Driving, diameter over tires	69 in.
Driving, thickness of tires	3½ in.
Driving journals, main, diameter and length	11½ in. by 18 in.
Driving journals, others, diameter and length	11 in. by 13 in.
Engine truck wheels, diameter	33 in.

Wheels (Continued)

Engine truck, journals	6½ in. by 12 in.
Trailing truck wheels, diameter	45 in.
Trailing truck, journals	9 in. by 14 in.

Boiler

Style	Conical
Working pressure	190 lb. per sq. in.
Outside diameter of first ring	81 7/16 in.
Firebox, length and width	114¼ in. by 84¼ in.
Firebox plates, thickness	Crown, sides and back, ⅜ in.; tube, ½ in.
Firebox, water space	5 in.
Tubes, number and outside diameter	216—2¼ in.
Flues, number and outside diameter	45—5½ in.
Tubes and flues, length	21 ft. 6 in.
Heating surface, tubes	4,110 sq. ft.
Heating surface, firebox, including arch tubes	320 sq. ft.
Heating surface, total	4,430 sq. ft.
Superheater heating surface	1,212 sq. ft.
Equivalent heating surface*	6,248 sq. ft.
Grate area	668 sq. ft.

Tender

Tank	Water bottom
Frame	Cast steel
Weight	166,500 lb.
Wheels, diameter	36 in.
Journals, diameter and length	5½ in. by 10 in.
Water capacity	8,000 gal.
Coal capacity	14 tons

* Equivalent heating surface = total evaporative heating surface + 1.5 times the superheating surface.

President Wilson Takes Over Railroads

Wm. G. McAdoo, Secretary of Treasury, Becomes Director General of Railroads But Retains Present Office

WASHINGTON, D. C., December 26, 1917 (By wire).

PRESIDENT WILSON on Wednesday evening issued a proclamation taking over the possession and operation of the railways of the United States under the authority of the act of August 29, 1916, effective at noon Friday, December 28, and appointing William G. McAdoo, secretary of the treasury, as Director General of Railroads. He also announced that he would recommend to Congress that the roads be guaranteed a net income equal in each case to the average of three years preceding June 30, 1917.

"I have exercised the powers over the transportation system of the country which were granted me by the act of Congress of last August because it has become imperatively necessary for me to do so. This is a war of resources no less than of men, perhaps even more than of men, and it is necessary for the complete mobilization of our resources that the transportation systems of the country should be organized and employed under a single authority and a simplified method of co-ordination which have not proved possible under private management and control. The committee of railway executives who have been co-operating with the government in this all-important matter have done the utmost that it was possible for them to do; have done it with patriotic zeal and with great ability, but there were difficulties that they could neither escape nor neutralize. Complete unity of administration in the present circumstances involves upon occasion and at many points a serious dislocation of earnings, and the committee was, of course, without power or authority to rearrange charges or effect proper compensations and adjustment of earnings. Several roads which were willingly and with admirable public spirit accepting the orders of the committee have already suffered from these circumstances and should not be required to suffer further. In mere fairness to them the full authority of the government must be substituted. The government itself will thereby gain an immense increase of efficiency in the conduct of the war and of the innumerable activities upon which its successful conduct depends.

"The public interest must be first served and, in addition, the financial interests of the government and the financial interests of the railways must be brought under a common direction. The financial operations of the railways need not then interfere with the borrowings of the government and they themselves can be conducted to a greater advantage. Investors in railway securities may rest assured that their rights and interest will be as scrupulously looked after by the government as they could be by the directors of the several railway systems.

"Immediately upon the assembling of Congress I shall recommend that these definite guarantees be given:

"First, of course, that the railway properties will be maintained during the period of federal control in as good repair and as complete equipment as when taken over by the government, and second that the railroads shall receive a net operating income equal in each case to the average net income of the three years preceding June 30, 1917; and I am entirely confident that the Congress will be disposed in this case, as in others, to see that justice is done and full security assured to the owners and creditors of the great systems which the government must now use under its own direction or else suffer serious embarrassment.

"The Secretary of War and I are agreed that, all the circumstances being taken into consideration, the best results can be obtained under the immediate executive direction of the Honorable William G. McAdoo, whose practical experience peculiarly fits him for the service and whose authority as Secretary of the Treasury will enable him to co-ordinate as no other man could the many financial interests which will be involved and which might, unless systematically directed, suffer very embarrassing entanglements.

"The government of the United States is the only great government now engaged in the war which has not already assumed control of this sort.

"It was thought to be in the spirit of American institutions to attempt to do everything that was necessary through private management and if zeal and ability and patriotic motive could have accomplished the necessary unification of the administration, it certainly would have been accomplished, but no zeal or ability could overcome insuperable obstacles and I have deemed it my duty to recognize that fact in all candor now that it is demonstrated and to use without reserve the great authority reposed in me. A great national necessity dictated the action, and I was, therefore, not at liberty to abstain from it."

The proclamation directs that the possession, control, operation and utilization of the transportation systems shall be exercised by and through William G. McAdoo, who is appointed and designated Director General of Railroads. And the "said director may perform the duties imposed upon him, so long and to such extent as he shall determine, through the boards of directors, receivers, officers and employees of said systems of transportation. Until and except so far as said director shall from time to time by general or special orders otherwise provide, the boards of directors, receivers, officers and employees of the various transportation systems shall continue the operation thereof in the usual and ordinary course of the business of common carriers, in the names of their respective companies.

"Until and except so far as said director shall from time to time otherwise by general or special orders determine, such system of transportation shall remain subject to all

existing statutes and orders of the Interstate Commerce Commission and to all statutes and orders of regulating commissions of the various states in which said systems or any part thereof may be situated. But any orders general or special, hereafter made by said director, shall have paramount authority and be obeyed as such."

The order does not affect the possession, operation and control of street electric passenger railways, including railways commonly called interurbans, whether such railways be or be not owned or controlled by such railroad companies or systems. By subsequent order and proclamation, if any, when it shall be found necessary or desirable, possession, control, or operation may be taken of all or any part of such street railway systems, including subways and tunnels, and by subsequent order and proclamation possession, control and operation in whole or in part may also be relinquished to the owners thereof of any part of the railroad systems or rail and water systems, possession and control of which are hereby assumed.

It is further provided that "the director shall as soon as may be after having assumed such possession and control enter upon negotiations with the several companies looking to agreements for just and reasonable compensation for the possession, use and control of their respective properties on the basis of an annual guaranteed compensation, above accruing depreciation and maintenance of their properties, equivalent, as nearly as may be, to the average of the net operating income thereof for the three-year period ending June 30, 1917, the results of such negotiations to be reported to me for such action as may be appropriate and lawful.

"But nothing herein contained, expressed or implied or hereafter done or suffered hereunder, shall be deemed in any way to impair the rights of the stockholders, bondholders, creditors and other persons having interests in said systems of transportation or in the profits thereof, to receive just and adequate compensation for the use and control and operation of their property hereby assumed.

"Regular dividends hitherto declared, and maturing interest upon bonds, debentures and other obligations, may be paid in due course, and such regular dividends and interest may continue to be paid until and unless the said director shall from time to time otherwise by general or special orders determine; and, subject to the approval of the director, the various carriers may agree upon and arrange for the renewal and extension of maturing obligations.

"Except with the prior written assent of said director, no attachment by mesne process or on execution shall be levied on or against any of the property used by any of said transportation systems in the conduct of their business as common carriers, but suits may be brought by and against said carriers and judgments rendered as hitherto until and except so far as said director may, by general or special orders, otherwise determine.

"From and after twelve o'clock on said twenty-eighth day of December, 1917, all transportation systems included in this order and proclamation shall conclusively be deemed within the possession and control of said director without further act or notice. But for the purpose of accounting said possession and control shall date from twelve o'clock midnight on December 31, 1917."

In accordance with the provision of the law possession of the roads is taken in the name of the secretary of war, the proclamation reciting that it is necessary in the national defense. The order applies to "each and every system of transportation and the appurtenances thereof located wholly or in part within the boundaries of the continental United States and consisting of railroads and owned or controlled systems of coastwise and inland transportation engaged in general transportation, whether operated by steam or electric power, including also terminals, terminal companies and terminal associations, sleeping and parlor cars, private cars and private car lines, elevators, warehouses, telegraph and telephone lines, and all other equipment and appurtenances, commonly used upon or operated as a part of such rail or combined rail and water systems of transportation—to the end such systems of transportation be utilized for the transfer and transportation of troops, war material and equipment to the exclusion so far as may be necessary of all other traffic thereon; and that so far as such exclusive use be not necessary or desirable, such system of transportation be operated and utilized in the performance of such other services as the national interest may require and of the usual and ordinary business and duties of common carriers."

The President in his statement indicates that Secretary McAdoo will retain his present office in addition to his new duties. The net income of the railways of the United States for the past three years, which the President says he will recommend be guaranteed to them, according to the latest annual report of the Interstate Commerce Commission was as follows:

In percentages of the book cost of road and equipment; 1915, 4.09 per cent; 1916, 5.8 per cent; 1917, 6.5 per cent (estimated).

REPORT ON LARMOND COLLISION

The Interstate Commerce Commission has issued a report, dated November 6, and signed by H. W. Belnap, chief of the Bureau of Safety, giving the nature and causes of the collision on the Southern Railway at Larmond, Va., near Orange, on October 21, when an engineman and a fireman were killed and six passengers, five postal clerks and 1 employee were injured. Northbound local passenger train No. 16, having taken the side track to wait for northbound passenger No. 42, started out of the siding immediately after the passage of the through train and was run into at the side by a second through passenger train, No. 38. The engine of No. 38 was overturned and its engineman and fireman were fatally injured. The line was straight and the weather was clear; and the inspector concludes that if any member of the crew of train No. 16 had looked back immediately before starting out of the side track, the collission might have been avoided.

The line is equipped with automatic block signals. There are no indicators at the switches but the rule requires that after the switch is set for a train to leave the siding, two minutes shall be allowed to elapse before moving the train forward. The inspector finds that the men in charge of No. 16 did not wait the two minutes; and No. 38 therefore, had entered the block section in which the siding is situated while the automatic signal (No. 834) indicated either stop or caution. The engineman, who died a few hours afterwards, said that it was "white"; but all the evidence contradicts this. By comparing the times and speeds of train 42 and train 38, the inspector is convinced that the testimony concerning the length of time waited by No. 16 is not true. The inspector cannot decide with certainty whether signal 834, when No. 38 approached it, was at stop or at caution. If train No. 42 had not gone far enough to clear the second block, and if therefore signal 834 indicated caution, the engineman, says the inspector, cannot be blamed; for under the rule, he would treat the indication only as a distant indication; an indication directing him to be prepared to stop at the next signal, but not to come under control at once. The engineman of No. 38 had had a clear record as engineman for 37 years, and all the employees involved were experienced men, with good records; but the inspector does not accept the testimony of the men in charge of No. 16 to the effect that they were on the siding four minutes or longer. The conclusion is positive that the turning of the switch, which would set signal 834 at stop, was not done until the engine of No. 38 had passed that signal; and as soon as it was turned No. 16 started out.

CORRELATING THE MILITIA AND THE RAILWAYS

By Brigadier-General Charles H. Sherrill
Adjutant General, State of New York.

Thanks to the preparation for war which is now going forward under the lead of the administration in Washington, energetic steps are being taken to send to the fighting front in Europe our regular army, our federalized national guard army, and all those who are taken into the military service through the operation of the federal draft law. It is, of course, difficult to conjecture how many months it will take to transfer all these men to the other side of the water, but the time is coming when that task will have been completed. When it is completed, and all the fighting men have been sent out of the country, how will there be safeguarded the lives of those who remain in the United States, and the property, including manufacturing and the munition plants which will then be working to their full capacity? This is a problem which deserves the best thought of the best minds in all parts of the country.

In New York State we have done our best to go forward to meet the problem without waiting for it to arrive, because preparedness in advance is the best form of preparedness. Believing in the militia we have used them as a basis upon which to build our structure of defense, and in that building we have sought the advice of the railways. In the spring of 1916 the "militia idea" of this country blossomed out into preparedness parades in 92 cities, with the impressive total of 2,850,000 marchers, led by the New York City parade of 140,139. Properly encouraged this same "militia idea" can, if wisely correlated with the railways, yield even greater results for the safeguarding of our land.

The New York plan of handling the guarding of our country, after our regular army, national guard army, and conscript army have all gone abroad, is that the two great factors available for that defense are the railways of the country, plus the militia, and that neither of those factors is anything like so valuable considered separately as the two together can be made to be if intelligently correlated. This combination of these two factors was described in detail by me, when, with the approval of the war department, I counselled recently in Washington with the Railway War Board upon the problem of railway guarding.

The reorganization of the New York Guard has been mapped out after careful study of the possibilities of railway transportation in this state, and after consultation with the best available railroad authorities. A large portion of any success which the New York Guard will have in the discharge of its duties will be due to the valuable co-operation which we already have received and are continuously receiving from the patriotic men who are at the head of the railway systems which form the arteries of communication of this state. We believe that too much stress cannot be laid upon the value to this country of the correlated efforts of the railways and the militia. Both of them deserve increased consideration by the public and by the government.

In the duty now being conducted by volunteer units from the New York Guard of protecting 95 miles of New York City's aqueduct, 420 miles of New York State's canals, and many important railway bridges and public buildings, we believe that our local militia, acquainted as they are with the geography of and the conditions surrounding the points they are guarding, can perform that work more efficiently than troops lacking that special information. We believe that the new battalion of the New York Guard, whose units stretch out along the southerly shore of Long Island, made up as they are from men who know well every inch of that coast line, can perform coast guard duty there more efficiently than could troops who are strangers to that coast. The efficiency of those local guards is more than doubled by their being posted according to a plan based upon careful study of the possibilities of rapid interchange or strengthening of their units by means of railway transportation.

By instruction of Governor Whitman, there has been recruited into the New York Guard twelve thousand men, who are now receiving a full equipment of uniforms and have already received their rifles and an adequate supply of ball cartridges. All of these military supplies have been paid for by the State of New York.

The old policy of having the units of the Guard confined to a few localities in the state has been reversed, and since September first we have placed New York Guard units in over a hundred localities, which is double the number formerly covered by the armed forces of this state. There are now units in almost every county of the state, so that our military protection is more widely distributed than ever before. The reorganization of the Guard has been published in General Orders No. 58, which shows where every unit is located and also its brigade and the names of the regimental commanders.

All of these brigade and regimental commanding officers were trained in the New York National Guard, and with but one exception, have served with the units to which they are now assigned. In their selection no political influence has been considered, and no friendships observed. No officers are commissioned except upon the recommendation of their commanding officers, and approved by their brigade headquarters. We have determined that there shall be preserved under officers of their own training and in their own armories, the fine traditions of each of our splendid National Guard units which entered the Federal service and lost their old numbering.

It is but natural that a governor like Charles S. Whitman, who is a proved friend of the budget system of government, and who was so farsighted as to insist on putting through in the face of much public misunderstanding the New York state military census, now approved and copied on all sides, and being utilized by the American and the British governments, should insist upon rigid economy in the matter of military expenditures. To carry out that idea, I have arranged that all military supplies in this state shall be purchased through my Quartermaster General, Major Michael Friedsam, who as president of B. Altman & Company has had a wide business experience in the matter of purchases of supplies in large quantities. This system of purchasing not only guarantees that New York secures the best possible value for its money, but also that the state's funds are being honestly and intelligently disbursed.

Under the able leadership of E. G. Miner, of Rochester, there has been organized in the Adjutant General's office, in Albany, a Division of Chambers of Commerce, and all over this state we are utilizing those efficient non-partisan combinations of our best business minds to aid in each and every administrative problem which confronts my department.

The New York Chamber of Commerce has already aided us by its careful examination of Camp Whitman and Camp Peekskill, and so has the Citizens' Preparedness Association with its careful scrutiny of the arsenal, and similar valuable results will soon follow in other localities.

The war disbursements of New York State are so great, and the purposes of their expenditure so important that we need the best business minds to advise us thereon, and that advice is being accorded to us in most generous measure.

Based on the sure foundation of skillful non-partisan business supervision of the financial administration of our military department, and forearmed with a carefully studied plan of correlating the militia with the railways, New York State should possess a reasonable confidence in conformity with its problems of safeguarding the lives and property of its citizens.

Monthly Meeting of Western Railway Club

An Informal Address on Co-operation by A. M. Schoyer and a Paper on the Business Box Car by W. J. Bohan

TWO addresses were delivered at the meeting of the Western Railway Club which took place at the Hotel Sherman, Chicago, on December 17. An informal talk was given by A. M. Schoyer, resident vice-president of the Pennsylvania Lines, following which the paper of the evening was read by W. J. Bohan, mechanical engineer of the Northern Pacific.

CO-OPERATION

Mr. Schoyer spoke in part as follows: The railroads have come to the point where they realize that if they are to have strength they must have union. They are now working together and while there is more business than ever before, there is less competition. There is still some competition on the western railroads, but there is very little between those in the East. On our own road we have turned all our traffic solicitors over to other work; some are in the transportation department, some in the accounting department, and others are serving on embargo committees.

The railroads have realized that they must get together to handle the present enormous business. The United States will spend in the next 126 weeks as many billions of dollars as it spent in the 126 years preceding. All of us will be called on to handle more government business in the next two years than in the 126 years before. Consider that in addition to this, we are supplying the armies of Europe and the people of this continent and it becomes evident that the railroads must combine their resources. By joining their forces and co-operating, by using the locomotives and all other facilities together they will get more business over the rails than was ever considered possible.

If the men now running the railroads cannot meet the railroad problem, no one in the world can do it. I know that we have the best railroad men in the world and lawyers, administrators, or college professors could not get 25 per cent as much traffic over the roads as the men now operating them can. For that reason we must co-operate; we must play the game together. Any railroad man at his regular work is doing more for the United States now than he could in any other place. We are needed here, for if the railroads can't go on, we can't win the war. In my judgment the duty of every man in railroad service is to press with might and main to make the railroads more efficient than ever before.

Any improper spirit of rivalry should be laid aside at this time. The carriers' function of keeping the government supplied is so tremondous they can't for a moment think of the interests of the individual roads as opposed to the interests of the nation. We must even subordinate the interest of the owners of the railroads to the interests of the country at large.

The western railroads are furnishing 102 locomotives to the eastern roads. These engines cannot well be spared from the western roads, but they have been turned over to the eastern lines where the need is greatest. This has been done because it is realized that that section of the country needs transportation and can only get it if the eastern roads have the locomotives.

There is great need of co-operation between employer and employee at this time, but there is little prospect of it unless the men come to realize that the United States must have its transportation lines in the best of condition to win the war. If we could make the laboring man realize this, we would get better transportation. The laboring men are organized and are now using the power of the unions with more force than ever before. They have an opportunity for doing loyal service to the country by making the transportation system operate at its maximum efficiency. If labor conditions continue to grow worse, I do not know how we will get men enough to run the railroads. Whether we have government control or government operation, the railroad men must continue to operate the roads. Let us all remember that our part is to do our best for our country in the place where we have been put.

THE BUSINESS BOX CAR

By W. J. Bohan,
Mechanical Engineer, Northern Pacific

It is my intention to offer a few remarks on the business of a box car and the relation of its construction thereto. I am taking the box car, as that type appears most frequently in interchange, and is probably receiving the greatest attention at the present time. An impression of the importance of box cars as they affect dividends can be gained from the following facts:

A total of 261,100 box cars were owned and operated by eight leading western and northwestern railroads during the last year, or an average per road of approximately 32,600. The total number of box cars represents 50.7 per cent of the total freight cars owned by these roads. These box cars may fairly be said to represent an original investment of $210,000,000.

The average total cost of repairs per road per year for a four-year period for all classes of cars was $3,481,000. The average cost of repairs per car per year was $64. The minimum cost per car per year for one of the roads was $41. The maximum cost per car per year was $110, a difference between minimum and maximum cost per car per year of $69, or $5 more than the average cost of repairs per car per year for all the roads mentioned.

The character of transportation on each of these roads is the same and the ratio of the number of box cars to the total number of freight cars of all classes is very nearly the same. It is fair to assume for the purpose of this paper that the above repair cost ratios for the different roads would obtain for box cars.

The claims paid for losses due to grain leakage by a large grain carrying line of the same group of roads for four years ending in 1917, averaged $80,000 per year, grain being carried in both owned and foreign cars. The average damage claims paid per year on account of defective equipment on all commodities other than grain for the same period was $17,000.

A stockholder of an inquiring turn of mind, or the president of one of these railroads, in view of the high loss and damage costs and wide difference in repair figures, would be justified in asking, "What is the matter?" Several things are the matter, and one of them is undoubtedly lack of business balance in car construction—box car construction—that being the type of car under consideration.

Improved Box Car Design Needed

For years mental and physical energy have been spent on box car design by the best and most loyal of men both technical and practical, and a generally satisfactory box car is not yet with us.

Have we kept it back by a flux of figures on stresses and strains lacking the leaven of sound engineering judgment?

Have we delayed its coming by building upon too narrow conceptions of the problem? Have we co-operated with each other sufficiently in treating a large subject in a large way, by exerting our energies toward a broad and careful analysis of the subject, with a full realization that box cars are business agents of the railroads that own them, and that their dividend earning capacity depends upon their commercial efficiency as well as upon their mechanical details, and have we realized that the two qualifications are correlated? The fact that we haven't the generally satisfactory box car indicates at least that the progress of its development has been slow. The time has arrived when we must develop an efficient box car in its fullest sense. The unusual volume of business, the shortage of equipment, the scarcity of labor and material with the constantly upward trend in the prices of both, demand it. What have we got to offer in the way of a business box car?

The business box car must be free from leakage of lading, it must be weather-proof and practically fire-proof, it must have a so-called non-sweating interior free from projections and pockets, it must have properly dimensioned door openings and substantial free positive functioning doors and fastenings, and be so constructed as to lend itself to diversified lading with the incidental supplementary doors, blocking, etc. In short, it must be a car popular with the shipper—a dividend earning unit having a maximum demand.

It must, in addition to these qualities, have a minimum light weight, a maximum utility and carrying capacity per unit of weight, reasonable first cost, and freedom from mechanical defects. Two principal elements enter into the design and construction of such a car. First, accurate technical engineering information, and second sound, practical business judgment based upon experience, the latter largely predominating for the reason that evidence is lacking that anyone ever reduced the things that happen to a box car to conclusive figures.

In a recent article in one of the railway magazines a statement was made that in train service the car body has three movements, all of which absorb a part of the force applied at the couplers. This is true as far as it goes, and if this were all, figuring would be comparatively easy. It, however, stops where the real trouble begins. The fact of the matter is that the box car is subject not only to these three forces, but the resultant of their combined action and many others of such varying direction, intensity and rapidity, of occurrence that their accurate mathematical determination is out of the question. Among these forces may be mentioned those due to poorly balanced design, unevenness of track, curvature, centrifugal force, train handling, draft action, irregular lading, shifting of lading, atmospheric conditions, etc.

Briefly, all of these forces combine in what may be called "team work" against the life of the box car. Close observation and experience with a large number of different types of box cars indicates that the general and greatest result of this team work manifests itself in twisting the car. Such being the case, team work in an opposite direction by the various members of the car must be the natural antidote.

I believe the most economically efficient box car to be one in which every detail, even the grab iron, is made to do its fair share in assisting the natural functions of the car and resisting the stress and abuse to which it is exposed. The body of such a car should not be built around any one member, but all of its members should form a unit having maximum inherent strength and resilience and acting as a unit in dissipating all reasonable strain action. It should have the fewest possible primary and special parts in that joints, gussets, rivets, bolts and fastenings which work and wear to the detriment of the car, increase its cost of upkeep and loss of time on repair tracks, may be reduced to a minimum.

General Specifications

A general specification for a car that would meet the requirements outlined would be briefly as follows:

The weight for a 40-ft. 40-ton box car should be between 45 and 50 per cent of the stenciled capacity. I should say it should not exceed 48 per cent. This weight can be obtained without sacrifice of strength.

The body should be steel framed throughout, preferably of pressed steel of resilient quality. The underframe, sides, ends and roof should be diagonally braced throughout. There is no question about the efficiency of diagonal bracing. Its value has been many times demonstrated in the reclamation of thousands of old cars. As the diagonal bracing of the entire construction will distribute the strains due to the live load and shocks to all members of the car, the fish belly type of center construction is not necessary. Ten-inch center sills of ordinary cross section are sufficient.

The side and end posts and braces, at the points of attachment with sills and plates, underframe bracing at the points of attachment with center and side sills, and roof bracing at the points of attachment with ridge pole and plates, should be directly connected, that is, the usual construction using gusset plates or other secondary members should be eliminated as the strength and efficiency of the car can be materially increased by so doing, and unnecessary parts eliminated. Autogenous welding may be used to material advantage in such a construction.

The diagonal underframe bracing at the ends should be securely tied to both the center and end sills at their junction, and extend continuously around the ends of the body bolster the cross ties, with alternate connections to the center and side sills. The same general construction may be followed in the roof for the attachments of the diagonal bracing and plates, ridge pole and door carlines. At the door openings the underframe should be substantially reinforced by supplementary diagonal bracing. The plate may be similarly reinforced above the door, or the door track constructed to form the reinforcement. The roof reinforcement at the door openings may be made by the use of carlines at the door posts. The end construction with its attachment to end sills and plates should be similar to the side construction.

The corner posts should be formed by directly connecting the end side post and side end post members throughout their entire length. This will not only tie the car together securely but it materially assists in forming an integral construction. The corners may be further reinforced by continuous corner and end grab irons. The side and end sheathing should be constructed of two sections of sheet steel, their junction reinforced by plates, and all securely riveted together forming side and end girths, the girth reinforcing plate extending continuously from side door post to side door post around the end of the car. The end and side lining should be of matched lumber, the sides ¾ in. or 13/16 in. thick, the ends 1¾ in. thick, the lining extending from floor to plates. The floor may be of the usual 1¾ in. matched stock secured to furring strips on the underframe, using standard grain strips at the intersections of the floor and the sheathing.

The roof should be of the circular type and may be constructed of two sheets of No. 16 steel running lengthwise of the car, with a joint at the ridge pole, the two roof sheets being securely riveted between the ridge-pole and a weather proof ridge-pole cap. The roof sheets should also be securely riveted to the diagonal braces, end and side plates, thus forming an integral member of the car capable of sustaining its share of the load. It is necessary that the inside of the roof be what is commonly called "non-sweating." This can be taken care of by the application of a heavy coat of ground cork and red lead or mineral paint applied to the exposed metal surfaces.

The door should be of steel, framed and sheathed similar to the body of the car, and mounted with weather-proof shields at the posts and plates.

The truck should, like the body, have as few parts as possible and be preferably of the cast steel type. Particular attention should be given the brake beam mounting to insure even brake shoe wear and proper alinement of levers and rods. All of these points are of extreme importance not only in that they may perform their special functions properly, but that irregular transmission of stresses to the car itself be avoided as far as possible. Brake equipment of standard makes is quite satisfactory. Special attention, usually lacking, to secure proper application and alinement of parts, is absolutely necessary to obtain safe and efficient results.

The draft gear should be of the friction type having a minimum recoil action, which should be just sufficient to readjust the parts in release. The travel should be approximately four inches. The shock dissipating capacity should be the maximum obtainable with prescribed travel and standard clearance conditions. The draft lug fastenings should approach strength sufficient to resist the maximum shocks regardless of draft gear capacity.

The holes in the framing should be die punched to templets. All rivets and bolts should be of the best quality obtainable and of full cross section. Bolts should have properly proportioned heads and clean cut and accurate threads to provide for wrench fit of nuts. Nuts should also be of the best quality and manufacture. The application of both rivets and bolts should be made without drifting, rivets having full and concentric heads and driven at the proper temperature.

Double nuts, lock nuts, cotters and split keys where used should be given special attention. I consider a good design of nut lock superior to a cotter or split key on account of the extreme difficulty in getting proper application of cotters or split keys. No one little thing is a source of more trouble on a car than loose nuts.

Too much stress cannot be placed upon the importance of more careful practical engineering study of both general and detail design to secure a well balanced, resilient car unit. Some manufacturers have done a great deal of excellent work in this direction on underframes, but have not in my opinion extended the resilient features far enough, as there is no reason why it should not extend to the entire superstructure. Particular attention should also be given to the selection and assembly of the best material obtainable.

In conclusion, it must always be borne in mind that the most efficient business box car is one so constructed and assembled that it will afford a maximum resistance to the development of chronic conditions arising from general and not maximum service stress. Such a car, reasonably maintained, will have the physical strength to take care of reasonable maximum stresses and at the same time represent a minimum first cost and up-keep, and be commercially efficient.

Discussion

In the discussion the necessity for a greater side clearance for couplers to facilitate coupling on curves and to eliminate unnecessary stresses on striking castings was brought out. Several members spoke on side bearing location and clearance and brought out the fact that there is little agreement regarding the most desirable practice. In discussing the efficiency of diagonal bracing, one of the members told of some 50-ft. steel automobile cars which were diagonally braced and figured in numerous derailments on curves. The side bearing location and clearance were changed but the trouble was not overcome until the diagonal bracing was removed. The opinion was expressed that extra weight is often necessary in cars as it reduces maintenance. Since corrosion weakens the cars the parts must be designed with excess strength. It was pointed out that the cost of maintenance of freight cars varies widely with the character of the service, the amount of switching and the topography of the road on which they are operated.

POOLING THE FACILITIES OF THE EASTERN RAILROADS

The eastern railroads' car pool, authorized on December 5 by the General Operating Committee of the Eastern Railroads, with F. G. Minnick as chairman with office at Pittsburgh, has issued General Order No. 1 containing regulations to govern the pool. The purpose is to pool all railroad coal-carrying cars upon the railroads coming under the jurisdiction of the committee, to the end that maximum efficiency may obtain in the handling of coal car equipment, and the various railroads have been asked to instruct their transportation officers to give their full support and earnest co-operation in carrying out the work.

The organization consists of the manager and office and field assistants under the jurisdiction of the General Operating Committee. The expenses are to be apportioned in accordance with direction of the committee. The cars subject to the pool regulations include all open top cars owned or otherwise controlled by the eastern railroads or private cars at home on such railroads, if authority is secured to include them, except flat cars and coke cars and assigned coke cars. The basis for the apportionment of cars is to be the current situation represented by the percentage of cars furnished or available to cars ordered and actual requirements for the transportation of designated commodities, provided the number of pooled cars on each member line currently is equal to the average number of cars now controlled by the pool that were on each principal line daily during the period of 90 days immediately prior to December 1, 1917; further provided that such percentage does not exceed the actual requirements of each member. Cars which belong to a non-member line consigned to a particular mine for loading railroad fuel coal are not to be counted in the daily report of cars furnished or available and the mine rating must be reduced accordingly. Daily telegraphic reports are to be furnished by each member line to the manager giving information as to the number of cars required for the loading of coal, limestone, ore, iron and steel, and miscellaneous loading, also the number and percentage of cars furnished or available for each of these commodities. A weekly report is also to be furnished on form C S 11 and a monthly location statement, showing all equipment on line by classes. The manager will maintain a permanent record of daily telegraphic reports.

The regulations provide: Self-clearing steel hopper cars and single, double or triple hopper bottom steel or wood gondola cars originally built and intended for the handling of coal and limestone or other similar products must not be utilized for the handling of shipments or iron or steel or other similar products except that they may be loaded in the direction of coal mines, limestone quarries or ore docks in order to avoid empty mileage. Gondola cars having flat or drop bottoms, tight or drop ends, measuring 36 ft. to 46 ft. in length, which were originally built for the handling of iron and steel, must not be placed at coal mines for coal loading except when the lading will be destined to points in iron and steel producing territory in order to avoid empty mileage. Pooled equipment must, as far as practicable, be placed for loading to destinations on railroads which are members of the pool to the end that such equipment may be, as far as possible, governed by pool regulations.

It is the obligation of the Commission on Car Service to issue such instructions and enforce their provisions to railroads coming under their jurisdiction who are not members of the pool as will insure the immediate return, loaded or

empty, as soon as released from the original load, to railroads who are members of the pool, of all pool equipment loaded to points beyond the jurisdiction of the pool.

Railroads must equalize the interchange of pooled equipment currently. When the equalizing of pooled equipment is not accomplished by members of the pool it must be adjusted by the manager at suitable periods. The manager is to order the apportionment of cars among member lines based upon the situation as indicated by reports and records of cars required and cars available. The distribution of equipment by the manager among member railroads must be accomplished with a minimum empty movement of cars in all cases.

The pool is effective as of December 5, 1917, and will continue during the period in which extraordinary operating and traffic conditions obtain on account of the war.

Under date of December 17, the general operating committee issued a circular urging all roads, in order to assist in making the car pool immediately effective and to relieve the manager during the period of its installation as much as possible until the organization and working machinery can be perfected, to demonstrate co-operation by individually carrying out the regulation regarding the equalization of the interchange of pooled equipment currently with their connections, and also, so far as possible, to keep cars on the home road. It was stated that there are numerous interchange conditions where in the ordinary course of business cars can be sent back to the home road with no material increase in switching and thereby be kept in the hands of the owners, not only facilitating the distribution, but assisting in their maintenance. It was felt that no hard and fast rules can be formulated to cover this point and the co-operative spirit of roads concerned is therefore relied upon.

The sub-committee on military transportation accounting of the Railroads' War Board has created an accounting organization to confer and co-operate with the General Operating Committee in respect to all matters in which the revenues of the railroads are involved. The organization consists of an accountant, J. E. Merion, assistant comptroller of the Pennsylvania Lines, with office at Pittsburgh, and field accountants appointed by him to be stationed at the headquarters of, and to co-operate with, the chairmen of the several sub-committees of the general committee, together with field accountants appointed at or transferred to terminals which may be used in common by two or more railroads, as may be directed by the General Operating Committee for the purpose of directing and aiding in the keeping of proper records of the use of such terminals. The accountant is a representative of the sub-committee on accounting, to which he will report. He will also, however, keep in close touch with the operating committee to the end that maximum results may be obtained through practical co-operation. The accounting committee assumed that a large proportion of the traffic will move via its way-billed route and that it will be only necessary to provide machinery to take care of freight diverted. Its conclusion was that this could be best done by the use of rubber stamps properly worded, the impress of which is to be placed upon each way-bill at each junction or interchange point at and through which diverted freight moves. The stamps are to be applied by the agent or other representative of the railroad first receiving the freight from its way-billed route and by the agent or other representative at each succeeding junction or interchange point in the diverted route. The stamp thus indicates the route traveled by diverted freight and forms a guide in the apportionment of revenues by the accounting office of the destination railroad.

As to common use of terminals, it was assumed that such use would be under varying conditions, including in some cases only fixed facilities and in other cases both power and facilities. Mr. Merion is to keep in touch with the committee on this question and to produce suggestions for each condition as it arises.

As to detours, it is the understanding that compensation for ordinary detouring will be settled for under the rates and rules of the American Railway Association, but there may be extraordinary detours, the compensation for which will have to be specifically arranged.

Mr. Merion has issued a circular giving instructions as to the accounting methods to be followed in connection with diverted freight, to the end that accounting officers of destination lines may apportion the revenue to the line performing the service. These regulations provide in detail for the use of the diverted freight stamp referred to.

The General Operating Committee has also issued a circular on the same subject, ordering that a revenue way-bill must accompany each and every car of freight diverted from its way-bill route. In event of accident or any unforeseen emergency, if a car diverted from its way-bill route should be delivered at point of interchange on a card way-bill the delivering road is instructed to issue therefor an astray freight way-bill under which the car will be delivered to the diverted railroad and travel to its final destination in lieu of a card way-bill. General instructions are also given for the use of the rubber stamps.

C. R. Gray, president of the Western Maryland, has been elected vice-chairman of the General Operating Committee to act for the chairman in his absence. Albert S. Ingalls, general manager of the New York Central, has been appointed a member of the committee to succeed P. E. Crowley. J. J. Bernet, president and general manager of the New York, Chicago & St. Louis, has been appointed chairman of the Cleveland sub-committee, vice A. S. Ingalls. R. E. McCarty, resident vice-president of the Pennsylvania Lines West, has been appointed chairman of the Pittsburgh sub-committee, succeeding D. F. Crawford.

On December 18 the General Operating Committee issued a modification of its embargoes on carload freight within the Pittsburgh switching limits to permit the movement of fuel, oil and tank cars from refineries located within the switching limits directly to points of consumption within the same district.

Having been informed of the organization of the Coal Shippers' Terminal Pool Association, for the expeditious handling and distribution of coal at Cleveland, Toledo, Akron, Columbus, Detroit, Canton and Youngstown and other points to be determined later, the General Operating Committee has requested the various railroads to co-operate heartily and thoroughly with the organization. Primary pools are to be put in operation as quickly as possible at scales for the purpose of eliminating switching and relieving intermediate terminals.

Some of the sub-committees of the General Operating Committee have found it advantageous for railroads in their territories to exchange locally repair parts and materials for repair of foreign railroad cars, the railroad having such cars for repair requisitioning and securing necessary repair parts for adjacent or connecting lines on which a surplus of such material exists. The committee has issued a circular expressing its desire that this practice be carried out wherever possible or expedient to do so.

Arrangements have been made by the Railroads' War Board for the lease from the government of 100 U. S. A. locomotives, ordered by the War Department for service in France, to eastern railroads in this country for the purpose of enabling them to reduce congestion. It was noted in last week's issue that 30 of these locomotives built by the Baldwin Locomotive Works had been delivered to four eastern lines. Effort is being made to obtain permission to lease 50 more. It is probable that some of the locomotives on order for the Russian government will also be devoted to the use of American roads. Although no definite announcement has yet been made, it is understood that further shipments of railway supplies to Russia have been held up on account of the political situation in that country.

Annual Report of the Bureau of Safety

Decrease in Defective Cars Found; Suggestions for Improvement Resulting from Accident Investigations

H. W. BELNAP, chief of the Bureau of Safety of the Interstate Commerce Commission, has submitted his annual report to the commission, presenting a series of statistical tables showing the results of the inspection of safety appliances on railroad equipment for the fiscal year ended June 30, 1917, and also a review of the year's work. An abstract of the report follows:

Table No. 1 shows the number of cars and locomotives inspected, the number found defective, the percentage defective, the number of defects, number per thousand cars, etc.

Table No. 2 presents the number of defects reported for each of the 16 classifications on individual railroads on which 500 or more cars were inspected. Table No. 3 is a report of terminal or standing tests of power brakes.

Table No. 4 contains statistical summaries for the past five years with comparisons of the condition of safety appliance maintenance on the part of certain representative railroads. The results of inspections of the years ended June 30, 1914, 1915, 1916, and 1917 are shown as follows:

	1914	1915	1916	1917
Freight cars inspected	790,822	1,000,210	908,566	1,100,104
Per cent defective	5.79	4.77	3.72	3.64
Passenger cars inspected	26,746	33,427	27,220	29,456
Per cent defective	1.04	2.85	1.82	.85
Locomotives inspected	32,761	38,784	31,721	37,199
Per cent defective	4.98	4.06	3.66	2.69
Number of defects per 1,000 inspected	67.48	57.23	45.56	41.16

A marked decrease is shown in the percentage of defects found in equipment inspected during the year, the percentage of defective freight cars, passenger cars, and locomotives all having reached the lowest point in the history of safety-appliance inspection. It is significant that this decrease has been attained by the carriers during a period not only of the greatest increase in volume of traffic ever handled by the railroads but also marked by a scarcity of labor and an inadequate supply of cars.

At a hearing on March 13, 1917, it was shown that 296,033 cars were not fully equipped in conformity to the prescribed standards of January 1, 1917. It also appeared that the carriers were confronted with practical difficulties, such as car shortage, insufficient labor, inability to obtain new equipment, and congested traffic conditions. Upon consideration the commission on April 12, 1917, granted a further extension of eight months from July 1, 1917, within which to comply with paragraphs (*b*), (*c*), (*e*), and (*f*) of the order of March 13, 1911.

Thus the order will become effective March 1, 1918, and the combined efforts of all carriers should be directed to the equipment of cars on each of their lines of road regardless of ownership, the owning carrier to be billed for the expense.

Attention is directed to the number of defects per 1,000 cars inspected, respecting the visible parts of air brakes. This number of defects—19.01—is out of proportion to the number of defects to other safety appliances; in fact, 46 per cent of all safety-appliance defects reported are due to defective air brakes. Thus a situation obtains which can not be too strongly condemned. The maintenance of the air brake to the point of maximum efficiency is a consummation to be striven for by all carriers regardless of whether the grades on a particular line of road demand such efficiency in the ordinary movement of trains. Level roads should maintain their air-brake equipment to the same degree as those having steep mountain grades. The impression is too prevalent that the order of the commission of June 6, 1910, is complied with when 85 per cent of the cars in a train have their power brakes used and operated, and this, no doubt, accounts in part for laxity in maintenance.

The standing tests of air brakes provide the only adequate means of ascertaining the true condition of braking power and as an element of safety is of inestimable value. It is encouraging to note that an increasing number of yards are being equipped with compressors and air lines for the testing of air-brake equipment, thus enabling proper adjustments and repairs to be made. However, there are too many terminals and yards where the only air-brake tests made consist merely of ascertaining whether or not the air is working throughout the train line. Such tests are inadequate, for the reason that the efficiency of individual brakes can not thus be determined. A system of careful inspection and tests at terminals by experienced and competent inspectors is therefore urged as a means of insuring adequate braking power on all trains.

Table No. 3 presents the condition of air-brake equipment in its most favorable aspect for the carriers, as it indicates the final result of inspections by our inspectors accompanied by the carriers' inspectors. In such inspections, in many instances, the first test develops that not even the minimum of 85 per cent of the brakes are operative, whereupon adjustments and further tests are made before the train leaves the terminal. The figures represent the condition disclosed by the final test; that is, the condition of the brakes when the train departed. These cases are not rare or isolated, and the very fact that when the commission's inspectors conduct terminal tests it is frequently found necessary to make repairs before even the minimum percentage of operative brakes required by law is available in trains discloses not only the need of better maintenance of air-brake equipment but also the absolute necessity for terminal tests and greater care and thoroughness in making them.

During the past fiscal year our inspectors not only inspected a greater number of cars and engines but in addition they investigated 80 accidents and conducted numerous special investigations respecting car shortage, and assisted in a number of tests of appliances relating to safety in railway operation. In their numerous activities they have shown marked ability and fidelity to duty.

Hours of Service

During the year ended June 30, 1917, hours-of-service reports were filed by 1,189 roads. Of the roads that rendered reports, 443 reported a total of 135,513 instances of all classes of excess service, an increase of 37,201 as compared with the previous year. The remaining 746 roads filed reports showing that no excess service was performed by their employees.

Of the 135,513 instances of excess service reported, 102,401 were employees remaining on duty longer than 16 consecutive hours, 3,432 were employees continued on duty after having been on duty 16 hours in the aggregate in a 24-hour period; 723 were employees who, having been on duty 16 consecutive hours, were returned to duty with less than 10 consecutive hours off duty; 184 were employees who, having been on duty longer than 16 hours in the aggregate in a 24-hour period, were returned to duty with less than 8 consecutive hours off duty; 25,320 were employees at continuously operated offices remaining on duty longer than 9 hours, and 3,453 were employees at offices operated only during the daytime, who remained on duty longer than 13 hours.

The causes of instances in which train service employees remained on duty longer than 16 consecutive hours on roads

reporting more than 25 instances of excess service, for the past five fiscal years, have been arranged in the following table for the purpose of comparison.

Causes	1913	1914	1915	1916	1917
Collisions	9,910	5,099	1,703	3,414	3,421
Derailments	88,317	53,481	25,209	25,013	30,395
Track defects and obstructions	10,620	5,712	2,567	4,696	3,982
Landslides, high water, fire	17,985	2,852	2,407	2,983	3,064
Adverse weather conditions	6,243	15,155	2,929	9,532	10,616
Congestion of traffic	13,812	3,992	1,059	1,769	16,250
Station work, waiting for orders and meeting trains	8,279	4,353	2,256	2,822	5,057
Coupler and drawbar defects	33,360	10,252	5,117	5,113	6,292
Miscellaneous car defects	17,753	10,914	7,509	9,386	10,246
Hot boxes	3,869	895	296	232	491
Air troubles	5,834	1,476	884	1,054	854
Taking or running for water	2,953	1,085	608	466	1,016
Cleaning fires	519	138	40	45	181
Low steam:					
Poor coal	485	269	95	30	671
Bad water	423	105	49	46	28
Leaking	5,585	1,818	882	607	656
Miscellaneous locomotive mechanical defects	15,507	6,810	3,779	3,616	4,738
Wire troubles	2,072	689	119	168	206
Sickness, death, personal injury	923	381	156	131	173
Miscellaneous	16,883	5,879	1,709	1,932	2,905
Total	261,332	131,332	59,373	73,055	101,242

The foregoing table shows an increase of 28,187 instances in which employees remained on duty longer than 16 consecutive hours over the number reported for the preceding year. More than 50 per cent of this increase is chargeable to one road. The enormous increase in business incident to the extraordinary demands upon the carriers led to congestion of traffic and to this cause alone one road attributed 12,032 more instances of excess service than were reported by it for the previous year. In addition to the figures shown under the heading "congestion of traffic," the increased number of instances of excess service shown under "derailments" and "station work, waiting for orders, and meeting trains" were undoubtedly largely attributable to the business increase of the carriers. Comparing these three classifications for 1917 and 1916 there was an increase of 22,098 cases of excess service of employees engaged in train service in 1917 caused by increased business, or more than 78 per cent of the total increase shown by the table.

A very gratifying decrease has been noted in the number of instances in which employees were compelled to return to duty without having had the required statutory periods off duty.

The number of instances in which telegraphers remained on duty longer than the periods permitted by law increased more than 57 per cent, probably due largely to the increased business which is reflected in congestion of traffic, and to the difficulty experienced by the carriers in securing and keeping competent employees.

It is suggested that in order to remove the diversity of court opinion, Congress should enact legislation that will make certain the intent of the law regarding the limitation of the hours of service, of the period within which such service may be permitted, and of the circumstances, if any, under which an employee may lawfully be released in such manner as to extend his period of duty beyond the 16-hour limit prescribed by law.

Medals of Honor

The investigation of applications for medals of honor under the act of February 23, 1905, has been continued, and two such medals have been awarded during the past fiscal year. The act authorizes the President to bestow bronze medals of honor upon persons who by extreme daring endanger their own lives in saving, or endeavoring to save, lives from any wreck, disaster, or grave accident, or in preventing, or endeavoring to prevent, such wreck, disaster, or grave accident upon any railroad within the United States engaged in interstate commerce. Since the passage of this act, 31 applications for medals have been filed, 22 of which have been approved and medals awarded, and 9 have been denied.

Investigation of Accidents

During the year ended June 30, 1917, this bureau investigated 80 train accidents, comprising 54 collisions and 26 derailments; 174 persons killed and 827 persons injured. Twenty-one of the collisions occurred on block-signaled lines, 11 being on lines where automatic block signals were in use and 10 on lines using some form of manual block system. Thirty-three of the collisions occurred on lines where the train order and time interval system of train operation was in force. Eight of the 11 collisions which occurred in automatic block signal territory were due to the failure of enginemen to obey signal indications. In these eight collisions 30 persons were killed and 77 were injured.

Disobedience of signal indications on block-signaled railroads presents one of the most serious problems. Some of the most disastrous accidents are due to this cause and occur on roads equipped with modern systems of automatic block signals where trains are operated by trusted employees of long experience. The investigation of probably the most serious accident which occurred during the past year disclosed that the signal system in use was of comparatively recent installation and represented the highest development of automatic block signaling practice. The apparatus was surrounded with all safeguards necessary to insure its proper operation, and thorough inspection and tests of the signals at the point of accident demonstrated that they were in normal, operative condition. However, a collision, resulting in the death of 20 persons and the injury of 5 persons, was caused primarily by the failure of an experienced and competent engineman properly to observe and to obey block-signal indications partially obscured by a dense fog. In a very large percentage of accidents due to this cause which have been investigated, a contributing factor has been dense fog or stormy weather. In previous reports it has been pointed out that the practice of permitting fast trains to run at normal speed under such conditions constitutes a grave menace to the traveling public, and it has been recommended that during foggy or stormy weather, when signal indications can be seen but a short distance, unless some form of automatic train control system is used, positive and definite instructions should be given prohibiting the running of trains at high speed.

Of the 10 collisions investigated which occurred in non-automatic block-signal territory, 4 were due primarily to the failure of enginemen to have their trains under proper control when approaching meeting points or in yards, 1 was caused by failure of a train crew to obey an order fixing a meeting point, 1 was caused by failure to protect by flag and another by the failure of a flagman to close a passing track switch, 1 was caused by failure of an engineman properly to manipulate the brakes for the control of a train on a mountain grade, 1 was due to the failure of an engineman to obey a stop indication of a dwarf signal, and 1 was due to cars fouling the main track.

The investigation of the collisions noted which occurred in non-automatic block-signal territory indicated that in certain instances little if any additional protection, as compared with the train-order and time-interval system, was afforded under the methods of operation employed. As was pointed out in the report for last year, on certain roads where the manual block system is used the investigation of accidents has disclosed that the benefits of the block system have been practically nullified by inexcusably bad operating practices, and even the most common and essential safeguards provided for the operation of trains have been disregarded. Nearly all of these accidents could have been averted by proper observance of the rules which were in effect. More than half of the collisions investigated during the past year occurred on lines operated by the train-order and time-interval system, and many of them were rendered possible by the inherent weaknesses of the method of operation employed.

In some of these cases inadequate operating rules were found, and in some instances it was found that practices were being followed which had grown up in the service, but which were not sanctioned by the rules. In one or two instances the employees involved failed to avail themselves of the facilities and safeguards for governing and protecting train movements provided for in the rules and resorted to methods and practices which could not in any manner be warranted or justified. It is a striking fact that the primary cause of each of the accidents investigated which occurred on lines operated by this method was the failure of one or more employees properly to perform some part of their duties; or, in other words, a so-called man failure. Many of these accidents could have been prevented by a proper application of block-signal principles. In comparison with the train-order and time-interval system, the block-signal system affords not only fewer opportunities for men to make mistakes likely to result in disaster, but it provides means for checking up and detecting such errors as do occur. It is true that accidents happen on lines operated by the block system, but it must be borne in mind that in general the lines carrying the densest and fastest traffic are operated by the block system, while the train-order and time-interval system is employed on lines of lighter and thinner traffic. It can not be questioned that there would be a very marked increase in accidents if an attempt were made to operate the block-signaled lines by the train-order and time-interval system; and it is equally certain that the adoption of the block system, together with adequate rules and proper operating practices, on lines now operated by the train-order and time-interval system, would avert numerous accidents on those lines. Since 1903 it has been repeatedly recommended that railroad companies be required by law to adopt the block system on lines not already so operated, and it is again urged as one of the most important measures for the prevention of railroad accidents that the use of the block system be made compulsory.

In previous reports the Commission has recommended legislation requiring the standardization of operating rules. It is obviously essential to the safety of train operation that rules be explicit and uniform, capable of being easily understood and applied, and not liable to be misinterpreted. Such standardization of rules can be accomplished only by Federal legislation. Cases have frequently been found in connection with the investigation of accidents where employees in responsible positions had not been properly instructed or examined on the rules; and any legislation which may be enacted upon this subject should provide for proper supervision to insure that railroad employees are properly instructed and examined, as well as that the rules are properly enforced and obeyed.

The commission's accident bulletin containing statistics for the calendar year 1916 shows that during that year there were on steam railways 5,737 collisions and 8,253 derailments, the total number of both collisions and derailments having increased but continuing in approximately the same proportion as compared with the two preceding fiscal years. Approximately 83 per cent of the derailments which occurred during the calendar year 1916 were due to two causes, 4,185 being attributed to defects of equipment and 1,664 being caused by defects of roadway. Twelve of the derailments investigated during the past fiscal year were caused by defective condition of track and track equipment.

Speed was a direct cause or a contributing factor in 9 of the 26 derailments investigated, 2 of them being due to excessive speed on sharp curves, 1 being due to a locomotive running backward at excessive speed over uneven track, another being caused by excessive speed with one side of locomotive disconnected, and another probably being caused by freight cars being run at excessive speed.

While defective equipment is apparently the most common and prolific cause of derailments, it is manifest that the most favorable result that can be attained by even the most rigid and thorough inspections which it is practicable to make is merely a reduction in some degree of the accidents due to this cause, for the reason that a derailment may occur at the time the equipment becomes defective. But it is believed that the cases in which the track or roadway becomes defective under a passing train and precipitates a derailment immediately form a very small percentage of the total number of derailments due to defects of roadway. As has been pointed out in former reports, existing federal law does not give the commission any supervision or jurisdiction over the condition of railroad track, and the commission is without authority to require its proper maintenance, although in many cases disclosed by investigation of accidents and in connection with regular inspection work performed by the commission's inspectors railroad tracks have been found so poorly maintained as to constitute a grave menace to the traveling public. It is beyond question that the existing condition of such tracks is responsible for a large proportion of the number of accidents due to defects of roadway. These matters have been pointed out in previous annual reports, and in various accident reports attention has been called specifically to certain roads and localities where better track maintenance was imperatively demanded by the requirements of safety. It is again recommended that the commission be given authority to conduct independent investigations with respect to physical conditions and operating practices on railroads, and to require the improvement or correction of unsafe conditions or practices which may be found to exist.

Investigations relative to failed material of both track and equipment have been continued during the past year. As was stated in the report for last year, there are some accidents due to failure of materials used in track and equipment which may be prevented by more careful inspection, while others can not be prevented by any sort of inspection, as the defects are hidden and do not disclose themselves until the material has failed. Several reports have been issued during the past year containing the results of investigations of failed material.

Investigation of Safety Devices

During the year plans of 94 devices were presented for consideration; 111 devices were examined and opinions thereon transmitted to the proprietors. Of the number examined, 99 were so impracticable or crude that they were considered worthless; 2 possessed meritorious features, but as a whole required further development before being entitled to serious consideration; 8 were devices which were not intended primarily to promote safety and which would not affect the safety of railway operation sufficiently to warrant further consideration, and 2 were considered to possess merit but were no better than similar devices now in use.

Supplemental tests of the Wooding train-control system on the Delaware, Lackawanna & Western Railroad, near Newark, N. J., referred to in the last annual report, were conducted during the months of January, February, March and April, 1917. The device had been redesigned in many respects and parts of the apparatus rebuilt since the previous tests were made. A report upon this system, dated May 10, 1917, was transmitted to the Congress by the commission.

During the month of February, 1917, the operation of the Julian-Beggs train-control system, which, as stated in the last annual report, was installed on the Queen & Crescent Route near Cincinnati, was observed preparatory to conducting official tests. It was found, however, that under the cold-weather conditions existing, the locomotive equipped with this apparatus was too small to haul the local train to which it was assigned; and as the company owning this device was not able to equip a larger locomotive and conduct proper preliminary tests of the apparatus before the season

had so far advanced as to preclude possibility of conducting the proposed official tests under the severe weather conditions of winter season, it was decided to postpone the proposed tests of this system until the coming winter season.

The revision of the automatic train-control system of the National Safety Appliance Co., San Francisco, Cal., mentioned in the last annual report, was not completed during the past fiscal year and the apparatus had not been developed sufficiently to require further inspection or trials.

The automatic straight air-brake system submitted by the Automatic Straight Air Brake Company, and mentioned in the last annual reports under the name of the California Valve & Air Brake Company, has been revised as a result of tests made by this bureau on the Atchison, Topeka & Santa Fe in November, 1915. Arrangements are being made by the proprietors to install the revised apparatus on the Virginian Railway for tests under the direction of this Bureau.

The annual statistical report for January 1, 1917, covering block-signal and train-order mileage, was compiled by this bureau and published by the commission. As shown by this tabulation, the total length of railroad in the United States operated by the block system on January 1, 1917, was 98,407.9 miles, of which 32,954.6 miles were automatic and 65,453.3 miles were nonautomatic. Comparing these figures with the corresponding record contained in the bulletin of January 1, 1916, there was an increase of 2,012.1 miles of road operated by the automatic block system and a decrease of 179.8 miles of road operated by nonautomatic block system. The tabulation indicates a net increase during the year in mileage of road operated by the block system of 1,832.3 miles.

RAILROADS TO ASSIST AVIATORS.—Among the rules adopted by the aircraft board, to be followed by the public in its treatment of army aeroplanes which may be forced down by accident, is one requesting railroads to ask all employees to keep watch for aviators landing in isolated regions and to furnish assistance. All trains or steamships are requested to stop to take on stranded aviators and also at whatever point the aviator may desire to leave the train or boat.

Looking Across the Richmond Yard; the Imo May be Seen at the Left on the Dartmouth Shore

The Wrecked Intercolonial Railroad Station in Which 60 Were Killed by the Falling of the Roof

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The Halifax Explosion Did Not Leave Much of the Richmond Railroad Yards

THE NEED FOR STORAGE FACILITIES*

By Francis Lee Stuart
Consulting Engineer

The first problem of the United States government in the present war is to marshal the resources of the country to produce, distribute and use such military supplies as may be necessary to win the war—and its second problem is to carry through such aims with the least possible disruption of economic conditions so that our people may have recuperative power to meet and cope with the more serious period of readjustment after the close of the war.

It seems logical that in the fourth year of the war the effort of the United States in order to be effective should be so ponderous that it will be irresistible, and to accomplish that end the production of material and men must accordingly be planned. The distribution of necessary men and supplies must depend on applied simplicity for the success of its large continuous movement. The use of men and materials of war as far as this discussion is concerned, may be left to the field of operations.

The resources of the country will produce the needed military supplies, and it is therefore absolutely essential that such supplies should be so distributed that they will finally be under actual military control in order that there may be a dependable quantity for use when and as needed.

With the above essentials in mind, the Terminal Port Facilities Committee and the Storage Committee of the War Industries Board have recommended to the Depot Board of the War Department that—

(a) Storage areas and port facilities be created abroad for holding several months' supplies.

(b) That storage areas under military control be created at Atlantic ports to hold in storage several months' supplies, and that a number of ports be used instead of two or three.

(c) That interior storage areas be provided near the source of production for the collection of carload or train-load shipments to the terminal ports.

In operation, as the storage reserve abroad is drawn on for use at the front, it is replenished by requisition from Atlantic terminal ports, which in turn are kept up to a fixed reserve by moving up supplies in an orderly manner from the source of production.

With the full realization that the winning of the war is the largest undertaking embarked upon by this nation, the various committees have felt that methods or principles of doubtful effectiveness were unwise, and were unanimous in recommending the safe and simple methods outlined.

Speaking as an individual, as an engineer, and not as a member of any committee, I wish to explain some of the logic involved in such an obviously simple recommendation and the bearing that it has on present transportation congestion. The ports selected were selected because the export and import shipment business of the United States for the last 20 years has built up interior transportation facilities in proportion to the business of the various ports, and in this emergency there is neither time nor man-power to create greater railroad road facilities than now exist, and the entire country's rails, North, East, South and West should be used to an economical advantage.

Engineering students of transportation know that the present methods of export transportation which rely on cars meeting ships or holding cars to load direct to ships should be abandoned as it is inefficient and uncertain. Preferential orders which command are in effect, priority orders and such orders cannot be depended upon for any continuous effort, as they will disrupt and break down any organization whether designed for transportation or for commercial purposes, so that storage areas are essential at the ports for the unloading of cars into them immediately upon the arrival of the cars and these areas are to be capable of holding several months' supplies available by lighters, truck or car for loading quickly any ship offered without delay.

The storage areas require sufficient size for expansion, as the uncertainties of the war are such that no man can foresee whether we shall have to furnish military material for two million or four million men or even a greater number. It is wise in planning for such a movement that the areas selected should be large enough to easily take care of a storage which can be expanded as required to meet the varying emergencies which may arise, without having to create new organizations or educate large forces in new methods.

It is necessary to build storage areas as there are no suitable storage areas available which are unoccupied by industries. The necessities of war will have a disastrous enough effect on the economic health of the country even with well thought-out endeavors to conserve the earning power and effort of the community and prevent the tearing down or disrupting of going concerns which in their indirect way, if not in a direct way, are necessary for our continuing strength.

Warehouses and layouts of the storage areas have been designed with due consideration of safety from fire or other risks. Quickness of despatch to ships, efficiency and simplicity of operation are other important and contributing conditions in the development plans, and while the storage areas are close enough to rail facilities which serve the ports they are segregated and their operation should not greatly interfere with the other efforts of the country.

Piers and berthing spaces for ships are available at every port, and it is recommended that we conserve man-power and materials by using such facilities as loading places for ships with materials from the nearby storage areas.

In 1913 had the business of the country been normally progressive the railroads would have been unable to avoid congestion as their improvements were not abreast with their needs; without the addition of new facilities the congestion of today was a certainty from every angle. Such congestion has been greatly augmented by abuses in use of cars for storage.

What can we do to avoid such congestion? In my opinion the greatest useful relief that can come in this crisis is the physical co-ordination of the railroads and a formidable public demand which will dictate a change in our business methods and coerce an immediate unloading and release of a car. This will require re-adjustment of business sites in the end, but the methods most intensively used to accomplish such result will be a storage area as a part of a business policy in every plant and a greater use of the already prepared roads, such as a city street for distribution by trucks or other means which do not require special tracks.

As to the railroad question per se, as long as republics require and encourage private capital to take the business risk of their early development and growth, there will be a desire as the country grows older and new generations control, to repudiate the cost of such agency, in spite of the fact that such help has made them great; but regardless of the merits of the case this is not an opportune time for either party to force the issue.

The railroads financial structure and credit have been crippled—how or why we have no time to consider now.—Their full usefulness must be conserved at all cost, but it seems to me unwise to further jeopardize their efficiency by government experimentation with their working organization. The railroads today are manned by an organization that has taken years to create and train. Their ability is unquestioned. The Railroads' War Board has its records behind it and only business effort ahead and is the survival of thousands of able men who have been seeking the same recognition. In my opinion, there is nothing in the accomplishment of any other business body today and certainly

*Address at the annual meeting of the Academy of Political Science, New York City, December 14, 1917.

not in the record of any government supervision that seems to me justifies any expectation that they could so efficiently guide the railroads' efforts as such a Railroads' War Board working with and for the President of the United States.

The congestion of today will be at its height in February and March. There will be attacks, criticisms, and what-not, and the usual scattering of ideas. The danger is that the country will try some cure-all, which will cause added confusion which will take months of efforts to overcome.

Let us hope it will be possible to get decisions and coordinate the many unrelated efforts of the government, and in spite of slow progress for the next few months, hold steadfast to tried methods of simplicity.

THE ACCOUNTING DEPARTMENT WAR PROBLEMS

In accordance with a resolution adopted at the meeting of the Association of American Railway Accounting Officers, held at Chicago, Ill., September 26, 1917, the president appointed a special committee of five to prepare recommendations as to how accounting officers may best meet the conditions confronting them with respect to clerical labor and the compilation of statistical data, particularly with respect to the use of mechanical devices as a means of solving the shortage in experienced clerical labor. The committee consisted of Mr. J. B. Duke, assistant comptroller, Southern Railway; C. E. Hildum, auditor of freight accounts, Erie; W. T. McCulloch, auditor of revenue, New York Central; J. S. Donaldson, assistant comptroller, Pennsylvania (chairman); and J. J. Ekin, general auditor of the Baltimore & Ohio.

After very careful and thorough consideration of the matter, the committee reported as follows:

It follows naturally that the answer to this phase of the situation depends largely upon the ability of the railroad to offer to clerical labor such compensation as would invite the acceptance of employment. On the assumption that each carrier is meeting the situation from the standpoint of offer of the highest compensation, which they are in a position to tender applicants for employment, consideration has been given, first: as to how to procure clerical labor. The present practices generally followed are: by awaiting applications from those seeking employment; advertisements in newspapers; notifying local agents of the desire of the general office to procure help; as well as through the various employees already engaged in the offices; and by application to business schools and colleges; and by the establishment of preliminary schools for the development of students to a point where it would be determined whether employment in the railroad offices would be tendered to such students.

The following suggestions are made:

In centers where it can be accomplished, co-operative schools, conveniently located, be established by the accounting officers of the carriers, through which students at such schools will receive sufficient development to determine whether or not they are qualified for positions in the accounting department of any of the carriers. The course of training in such school to be of such a character that the experience would be valuable to the carriers.

Retaining and Developing the Forces Employed

It is found that the practice prevails today of establishing night schools at which the employees of the accounting department are invited to attend, in order that they may receive instructions and education along particular lines, such as the application of rates and tariff classifications and divisions, the use of mechanical devices, shorthand and typewriting; and it is suggested that these be also extended so as to include instruction along other particular lines where there is necessity for help in such branches of the accounting departments and where vacancies are likely to occur.

The matter of office supervision is considered a very important feature in the development of efficient clerks and particularly so at this time when there is such a large proportion of such clerks who by lack of experience fail accurately to perform the work assigned, and it is recommended that those charged with the duty of overseeing the work should give very careful scrutiny to this, in order that unnecessary work may be avoided, which naturally follows inaccurate or imperfect production, with the thought that correct and proper handling of work in the first instance would eliminate much unnecessary work involved in the subsequent correction of the inaccuracies.

The assignment of certain picked employees to this feature of office practice as a special proposition seems highly desirable and has produced beneficial results where carried out.

Compilation of Accounting and Statistical Data

It has been found that practices are in effect in the accounting departments of careful scrutinizing statistics or accounting department data which is furnished, to the extent that in every case the necessity for the data is being carefully inquired into and the cost of preparing it submitted at the same time, with the result that it has been developed that the data sought for involved an unwarranted expense as compared with the use to be made of such data, and this practice has resulted in the curtailment of such information, or the elimination of it entirely.

It is recommended that the accounting officers take the initiative by asking the co-operation of the traffic, operating and other departments in a canvass of the situation, respecting statements and statistical data prepared, with the idea in view of determining what, if any, real practical use is made of the information furnished, or if the company's interests would be in any way injured if such statements or statistical data would be discontinued. It is recommended that consideration be given to the question of estimated earnings and expenses during the war period, as it is felt that a saving in clerical labor can be effected in this way. It is also recommended that very careful consideration be given to the elimination of furnishing copies of billing to traffic officers, or to connecting lines, as it is very probable that to a very great extent no adequate use is being made of such copies, or where use is being made, it is questionable whether the service obtained from such copies justifies the expense involved in preparing and mailing it.

Too much consideration cannot be given to the establishment of through billing when through rates are provided and simplified per cents are provided for apportionment of the revenue. This matter is now receiving attention of the highest executive officers and accounting officers should take an active interest in preparing data for consideration of such executives, which will demonstrate to them the increased cost and the delay to traffic which results from junction billing, and should, also, show the burdens which are transferred from agencies to audit offices by the inauguration of interline billing, when percentages are not provided. This association has been active for years in its endeavor to secure through rates and simplified divisions and every advantage should be taken of the present opportunity, as economies of operation and conservation of man-power are sure to result from the extension of interline billing when percentage basis of division can be used. It is the thought of this committee that through billing arrangements should not be extended, except when through rates and percentage divisions are provided, unless, it may be found desirable by interested lines to arrange for two line through billing even when the arbitrary method of apportionment must be used.

In the agencies, much labor can be eliminated by the abolishment of detailed forwarded reports and reducing such reports to merely a record of waybills made, by num-

bers, and giving the auditor sufficient record to check the reporting of the waybill by the receiving agent.

In the matter of collection of charges from accommodation parties, by having the waybills pass through a revision bureau before the freight bills are tendered to the accommodation patrons and having all the collections made through a central bureau representing the treasurer, much detailed clerical labor can be saved in the local freight stations.

In the matter of billing, the committee would strongly recommend the use of a separate waybill for each shipment as being the means whereby, when desired, all the documents necessary for the transportation, accounting and collection of charges for a particular shipment can be prepared in one operation, as well as facilitating the movement of freight with the billing and making waybills more legible by reason of having only one shipment on each waybill. Consideration should also be given to the elimination of duplicate auditing of interline accounts, two or more roads accepting the audit of one carrier, covering both passenger and freight business, so that the audit of one carrier will be sufficient to protect the interests of both.

Accounting Mechanical Devices

It is suggested that each of the standing committees make a supplemental report to those already existing in the proceedings of the Association of American Railway Accounting Officers on June 26 and 27, 1912, at Quebec, with regard to the use of mechanical devices.

Under present conditions, every effort should be made to strengthen our forces—both in the general offices and at local stations—by the use of mechanical devices. It is not practicable for this committee to go into details with respect to the merits of the various kinds of machines, as the adaptability of such machines can best be determined by study of local conditions. The principle governing the installation should be kept clearly in mind—that mechanical devices which may be operated by female clerks, without extensive experience, should be used wherever practicable, to release experienced men to take care of the more technical part of the work with which they are familiar. As examples —computing machines may be used for figuring extensions and footings on waybills—permitting revision clerks to devote their entire time to the revision of rates. Such machines may also be used for making extensions on shipping orders, and waybilling machines for preparing waybills, reducing to a considerable extent the work performed by experienced rate clerks.

Mechanical devices when installed should be accompanied by expert operators and their use should be carefully supervised. No economy is effected by the purchase of costly machines to be used under any other conditions.

Photograph by Central News Photo Service.

View Through a Shell Hole in a Damaged House on the Cambrai Front, Showing Tommies Loading a Light Railway Car with Bombs

NORTHWESTERN OPENS SOCIAL SERVICE BUREAU FOR SOLDIERS

With lines running both to Camp Grant, Ill., and the Great Lakes Naval Training Station, the Chicago & North Western carries more sailors and soldiers in and out of Chicago than any other road. Recognizing that the Chicago terminal of the North Western is an exceptionally large gathering point for these men, the executives of the road decided that it was the logical location for recreation rooms and a social service bureau for them.

Many of the soldiers and sailors are strangers in the city and exposed to the dangers growing out of chance acquaintances and unfortunate environments encountered in the quest for entertainment. It was with the idea of furnishing them with wholesome recreation and suitable companions that a social service bureau was opened in the station for the registration of soldiers and sailors. Each man who desires to do so may leave his name with the social service attendant, stating the time he will be in Chicago and the length of his stay, even though it be for only an hour. Citizens of the city, on the other hand, who desire to extend their friendship to the enlisted men are asked to notify the bureau when they can entertain a soldier or sailor and how. Both parties are brought together in this manner and in this

Social Service Secretary at Work

way enlisted men are provided with wholesome entertainment, whether it be a dinner, a dance or a theatre party.

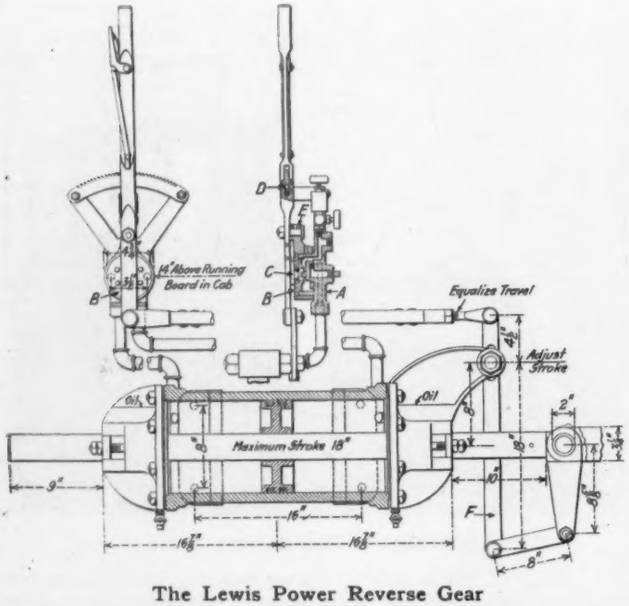
For the entertainment and comfort of the men while waiting for trains at the terminal the North Western has provided recreation rooms containing comfortable chairs, reading and writing materials, music in the shape of a victrola

View of Recreation Room

and piano, bathing facilities in the way of porcelain tubs and shower baths, and a modern lunch counter where lunches can be procured at the lowest prevailing prices. In addition, cigarettes, cigars and candies are sold at cost.

LEWIS POWER REVERSE GEAR

The Lewis power reverse gear, which is shown in the illustration, is characterized by simplicity of construction and a high degree of adaptability so far as its location on the locomotive is concerned. These qualities have been obtained by the location of the control valve in the cab, where it is



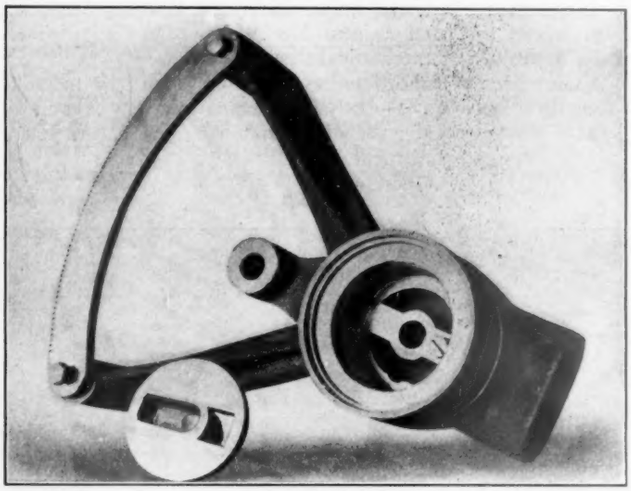
The Lewis Power Reverse Gear

directly connected to the reverse lever, and by dispensing with the crosshead and guidebar for the piston rod. This gear is the development of the Commonwealth Supply Company, Richmond, Va.

The attachment of the gear to the locomotive is effected by means of brackets cast integral with the cylinder. Because of the absence of attachments for a guidebar or other parts of the gear, it is thus possible to bolt the gear directly to the under side of the running board, to brackets attached to the boiler or to the frame of the locomotive, as the requirements of each particular case may make most desirable. The cylinder is merely turned to bring the faces of the brackets in the desired plane, the cylinder and heads being assembled with the brackets at the top, sides or bottom, as the case may be. The drain cocks have been placed in the cylinder heads in order that there may be no need of drilling special holes in the cylinder for each method of attaching the gear to the locomotive.

The control valve is of the rotary type with the seat in a vertical plane. Air is admitted to the top of the valve in the valve housing *A* and is admitted to the cylinder ports by means of a port through the valve. The exhaust cavity in the face of the valve is always in communication with a port in the valve housing leading directly to the atmosphere. The valve is operated by means of a stem or port *C*, in the end of which is a slot fitting over a rectangular lug on the top of the valve, thus relieving the valve of any tendency to tilt due to improper alinement of the operating post. To the outer end of the post is keyed a short arm, in the upper end of which is a slot working over a hardened block on the reverse lever.

The reverse lever has no fixed pivot. The initial movement of the lever is pivoted about its lower end, where it is



The Quadrant and Valve Housing with the Rotary Valve Removed

pinned to the back end of the reach rod. The extent of this movement is limited by a special tap bolt in the valve seat, the head of which extends up into the admission port in the valve and permits the valve to move in either direction only sufficiently to register with the admission ports in the valve seat. If the movement of the lever is forward, air is admitted to the rear end of the cylinder and immediately causes a forward movement of the piston. This is communicated to the lower end of the lever through the stroke lever *F* and the reach rod, and permits the continued movement of the upper end of the lever in a forward direction. During this part of the motion the lever is pivoted about the control valve connection and is retained in its proper location relative to the quadrant by means of the reverse lever guide *E*. This guide is a sleeve mounted on the valve housing, about which it is free to revolve. When the desired movement of the reverse lever is completed and the lever latched, the latch on the quadrant becomes the fixed point in the further movement of the lever necessary to lap the valve.

The quadrant is notched for 30 cut-off positions each in forward and back motion, a very fine adjustment thus being provided. There is a spring latch *D* on the reverse lever

which operates underneath the quadrant to indicate when the lever is in central position. This assists the hostler in locating the exact center of the motion with certainty.

When there is no air pressure on the reverse gear, the lever can be moved only slightly; it is impossible for it to be thrown into one of the corner positions until air pressure is available to effect the movement of the link blocks to a corresponding position. This is the result of the limited movement of the rotary valve. After the side of the valve admission port comes in contact with the head of the tap bolt projecting up from the seat of the valve the further movement of the reverse lever is dependent entirely upon the movement of the piston.

One of the unique features of this reverse gear is the ease with which the length of the piston stroke may be adjusted without blocking off the corners of the quadrant. There is a vertical slot in the stroke lever *F* where it is pivoted to the front cylinder head. The end of the pivot pin extends through this slot, in which it is secured by two nuts, one on either side of the lever. An adjusting screw, the length of which is equal to that of the slot in the stroke lever, is threaded through the pivot pin, and by means of this screw the position of the pivot pin in the slot is determined. It is possible with this arrangement to vary the relative lengths of the two arms of the stroke lever by an amount sufficient to change the length of the stroke from 18 in., which is its maximum, to 15 in., without affecting the movement of the reverse lever on the quadrant.

A crosshead and guide having been dispensed with, the piston rod is guided by means of long sleeve glands in both cylinder heads. These glands are bored to a running fit for the piston rod and are of sufficient length to provide the necessary bearing area. The glands are adjusted against the packing in the usual manner. The cylinder heads are cast with large oil pockets which communicate with gutters milled in the piston rod glands for lubricating the piston rod packing and gland bearings. The lubrication of the control valve and the cylinder is cared for in the cab, the lubricator being attached directly to the valve housing *A*.

DEATH OF SENATOR NEWLANDS

Senator Francis G. Newlands of Nevada, chairman of the Senate Committee on Interstate Commerce and of the Joint Committee on Interstate Commerce which is conducting a general inquiry of subjects pertaining to railway regulation, died suddenly at his home in Washington on December 24. As chairman of the Senate committee he had been expected to take charge in the Senate of the railroad legislative program to be recommended by President Wilson and he had held several conferences with him on the subject.

Senator Newlands had been chairman of the Senate Committee for several years and has therefore had an important influence on all transportation legislation in Congress and under President Wilson he has been regarded to a considerable extent as the administration spokesman on railroad matters. Personally he has taken a great interest in transportation matters and he has generally been friendly to the railroad cause in his efforts to place railway regulation on a sound basis which would promote railroad development. For years he has been an advocate of federal incorporation for railroads. He has also taken a great interest in waterway and irrigation legislation and recently had succeeded in having passed a bill providing for a comprehensive study by a special commission of waterways both in their relation to transportation and in their relation to irrigation and flood control.

Senator Newlands was in his seventieth year. He was born near Natchez, Miss., August 28, 1848, and entered the Class of 1867 at Yale, which he left in the middle of his junior year. He studied law at the Columbian College Law School at Washington, and before he was graduated was admitted to the bar of the Supreme Court of the District of Columbia. He went to San Francisco in 1870, and became there a prominent member of the bar. In 1888 he became a resident of the State of Nevada, from which he was shortly after elected to the Fifty-third Congress. He served several terms in the House of Representatives before being elected to the Senate in 1903.

DISASTROUS COLLISION AT SHEPHERDSVILLE, KENTUCKY

In a rear collision of southbound passenger trains on the Louisville & Nashville at Shepherdsville, Ky., 18 miles south of Louisville, at about 6 p. m. on December 20 (Thursday), 45 passengers and two employees were killed and 40 or more passengers were injured. The employees killed were the conductor and the flagman of the leading train; and these two men, in the accounts given by the road to the newspapers, are named first as those responsible for causing the collision.

The leading train was a local passenger, No. 9, which had just started forward from the station and was to be set off on the side track to wait for the following train, an express. This train, No. 7, was about two hours late. It appears to have come on at full speed, and the rear car of the local train and the one next to it, both wooden coaches, were split open and completely wrecked. The express train consisted of one of the heaviest locomotives and nine steel cars, and there were no serious casualties in that train.

The statement issued by the company says that the men in charge of No. 9 were blameworthy, not only at the station, but also before reaching Shepherdsville, for not protecting their train at the rear while they were losing time. It says also that No. 7 should have approached under control; this because the train-order signal, which was in the proceed position for the local train, was motionless; whereas the rule requires the engineman to refuse to pass such a signal unless he sees it change from the stop indication to the proceed indication. There was a clear view for two miles. The space-interval system was not in use, though this section of the road was reported, a year ago, as having the manual block system.

On Saturday, December 22, President Milton H. Smith issued a statement to the public proposing arbitration of claims against the railroad, on behalf of persons killed or injured, to save legal expenses. This statement said, in part:

"Standing in the presence of the gravest catastrophe in the company's history, I feel, speaking for my associates and myself, utterly unable to adequately express how deeply we deplore the deaths and injuries and how profoundly we sympathize with those to whom have come these sufferings and bereavements. They and the general public are entitled to know just how the calamity came about, and this they shall know to the fullest . . . The Louisville & Nashville has never knowingly contested a just claim . . . and I desire hereby to definitely acknowledge legal liability in the case of the death or injury of all passengers; and I propose and request that the Hon. A. O. Stanley, the Governor of Kentucky, appoint a committee of three men of integrity and high standing, one each from the counties of Bullitt, Nelson and Washington, to whom shall be submitted all claims, settlement of which the company and the claimants cannot agree upon, their decision to be final.

"This will save the claimants the delay and expense of litigation, will insure a certain and just determination of their rights, and will guarantee their receiving the full amount awarded instead of dividing it with others. This proposition is not dependent upon acceptance by all claimants, but is open for three months to all who may desire to avail themselves of it."

TRAIN ACCIDENTS IN NOVEMBER[1]

The following is a list of the most notable train accidents that occurred on the railways of the United States in the month of November, 1917:

Collisions

Date	Road	Place	Kind of accident	Kind of train	Kil'd	Inj'd
11.	Western Md.	Garrett.	bc	F. & F.	1	4
†12.	Denver & R. G.	Cotopaxi.	rc	P. & P.	3	16
24.	Union Pac. A. T. & Santa Fe	Topeka.	xc	P. & P.	0	6

Derailments

Date	Road	Place	Cause of derailment	Kind of train	Kil'd	Inj'd
5.	Central N. J.	Jersey City.	exc. speed	P.	0	1
11.	Great Northern	Minneapolis.	d. eq.	P.	0	2
21.	Seaboard	Millbrook.	.....	P.	0	1
*22.	Norfolk & W.	Rippon.	d. eq.	P.	0	0
25.	St. Louis-S. F.	Weleetka.	acc. obst.	P.	2	3

The trains in collision near Garrett, Pa., on the 11th were through freights. Both engines and ten cars were badly damaged. One trainman was killed and four were injured.

The trains in collision near Cotopaxi, Col., on the 12th were eastbound passenger trains carrying troops. The leading train, moving at very low speed because of a freight train ahead, which had been delayed, was run into at the rear by a following train moving at about 25 miles an hour. Three soldiers were killed and sixteen were injured. Responsibility for the collision is charged against the men in charge of the leading train, who failed properly to protect the rear end of the train by flag.

The trains in collision at Topeka, Kans., on the 24th were a passenger train of the Union Pacific, No. 102, third section, carrying soldiers, and passenger train No. 105 of the Atchison, Topeka & Santa Fe. The U. P. train ran into the other at the crossing of the two roads. The U. P. train had stopped 300 ft. from the crossing. Three trainmen were injured.

The train derailed near Jersey City, N. J., on the 5th was an eastbound passenger. The locomotive left the rails and was overturned and one coach was derailed. One passenger was slightly injured. The cause of the derailment was excessive speed at a crossover.

The train derailed near Minneapolis, Minn., on the 11th was an eastbound special passenger, carrying troops. Two trainmen were injured and several soldiers were slightly hurt. The train was traveling at about 40 miles an hour. Four cars were ditched, three of them being overturned. The cause of the derailment was the failure of some part of the car first derailed, causing an obstruction on the track.

The train derailed at Millbrook, N. C., on the 21st was northbound passenger No. 4. The locomotive was overturned and one employee was injured.

The train derailed near Rippon, W. Va., on the 22nd was northbound passenger No. 28. All of the injuries to passengers and employees were reported as slight. The cause of the derailment was a loose tire.

The train derailed on the St. Louis-San Francisco, near Weleetka, Okla., on the 25th was a westbound through passenger. Traveling at full speed the engine was thrown off the track by a piece of iron wedged in a frog, and was overturned. The engineman and one other trainman were killed and three passengers were injured. The iron had been placed on the track by mischievous boys.

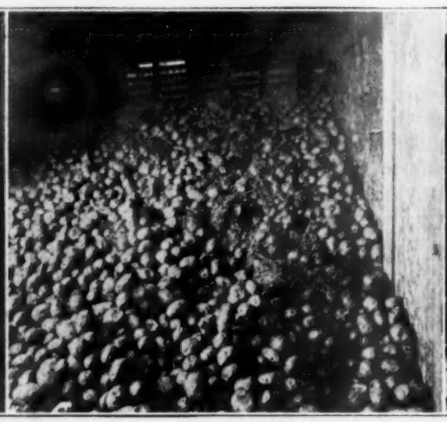
Electric Car Accidents—Serious accidents to electric cars occurred at Angola, N. Y., November 9; near Lorain, Ohio, November 8; near Youngstown, Ohio, November 12; and near North Lima, Ohio, November 4. Ten or more persons were injured in each accident and at Angola one of the injuries resulted fatally. Angola and North Lima were butting collisions; the Youngstown case was a rear collision in a fog and at Lorain a passenger train of the Lorain, Ashland & Southern ran into a street car at a grade crossing.

[1]Abbreviations and marks used in Accident List: rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

BURLINGTON CONSERVES FOODSTUFFS AND PREVENTS CLAIMS

An exceptionally early frost resulted in heavy shipments of damaged perishables this fall. To prevent a flood of damage claims and at the same time to conserve car space and save sound perishables from contamination by frosted vegetables, the Chicago, Burlington & Quincy inaugurated an inspection of perishable freight at points of origin. In the potato growing section of western Nebraska it has four inspectors who examine and make a record of each car of vegetables loaded for shipment. The railroad, of course, is bound to accept any shipment which it may receive, but the knowledge that a record is kept of the condition of the lading at the time of loading has been a sufficient inducement to shippers to sort out damaged perishables and send forward only those which are sound.

Car Well Loaded for Bulk Shipment



Carelessly Loaded Car Containing Trash and Straw

Frozen Potatoes Sorted From Car

The right-hand photograph shows a pile of frosted potatoes which were sorted from a car at Alliance, Neb., because the inspector of the Burlington refused to give it a clear billing until the damaged potatoes were removed. The center illustration shows a car of Red Triumph potato seed stock which was loaded at Hemingford, Neb., and contained so

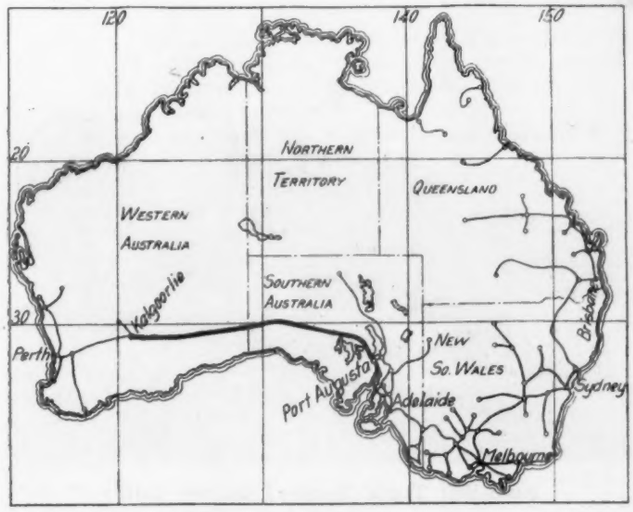
much frost that it had to be resorted. The photograph, which was taken before the frozen potatoes were removed, also shows the careless manner in which the car was loaded. No effort was made to load the car to anywhere near capacity, and no pains were taken to sort the potatoes as to quality or size or to keep them free from straw and refuse. The view on the left shows a car well loaded for bulk shipment. This car was loaded practically to the roof at the ends and contained well-graded potatoes.

At the request of the railroads in Illinois, the State Food Administrator has agreed to provide inspection of perishables at points of origin to prevent damage to food in transit. It is expected that similar action will be taken by the food administrators in other states.

Because of the large percentage of wet corn this year, various agencies are taking steps to prevent unnecessary loss on this account. At some points artificial driers have been provided, but this method of saving the grain is too expensive for general use. The Burlington recently sent out a bulletin to bankers, county newspapers and county agents in the territory it serves, urging the wet corn to be treated with salt at the rate of one barrel of salt to a thousand bushels of corn. This practice has been tried out in other years, and the results have proved satisfactory in every way. The Burlington also gives preference to cars loaded with corn, to reduce damage to the crop while it is waiting for shipment.

AUSTRALIAN TRANSCONTINENTAL LINE COMPLETED

The first east-and-west transcontinental railway in Australia was recently completed when a new line was opened from Port Augusta, South Australia, to Kalgoorlie, West Australia, 1,053 miles. At the latter point the new road connects with the West Australian line from Perth on the Indian Ocean coast and at Port Augusta it joins the South Australian railway to Adelaide. A recent article in the "Railway Gazette," London, contains a description of the new road based upon a letter from Perth, giving an account



Location of the New Line

of an official journey made over the Australian Trans-Continental Railway when all but 114 miles had been completed. This trip was undertaken by a large party of members of the federal and Western Australian parliaments and government officers, including Hon. P. J. Lynch, Federal Minister of Works and Railways, and J. J. Poynton, Director of Transport. The through trip from Perth to Port Augusta took five days, the party travelling by daylight only, and the intervening unconstructed gaps being covered by motor car (90 miles) and by carriage (24 miles).

Mr. Lynch was of the opinion that by the time the line was properly ballasted and brought up to the high speed standard the cost would reach £7,000,000 sterling ($34,000,000), or more, as against an original estimate of about £4,000,000 ($19,000,000.) From Kalgoorlie the line runs through a fine belt of timber for 70 miles, after which it passes through a lighter timber belt and enters a large area of limestone plains, 450 miles in width. In that stretch there is 309 miles of straight line running through a tremendous sweep of open country with nothing to relieve the eye but blue bush, salt bush and other native shrubs.

The minister expressed satisfaction with the rate of progress, but believed that if ordinary foresight had been exercised at the outset the railway would long since have been completed. Although the line traverses practically 1,000 miles of dry country and it was essential that an adequate water supply be secured, this all-important provision was neglected and 90 per cent of the delays which occurred later were due to this cause. At present condensers are being employed to obviate this difficulty, but steps are being taken to secure a reliable water supply throughout the entire line.

The transcontinental road is designed for high speed traffic with the expectation that it will prove practicable to make the journey between Port Augusta and Kalgoorlie in about 24 hours, or at an average speed, including stops, of 44 miles per hour. The line will not, however, be fully ballasted for some time, and consequently it is estimated that the average speed cannot exceed 30 miles an hour, permitting an average time of 35 hours for the trip between Port Augusta and Kalgoorlie. The rails weigh 80 lb. per yd. and are 40 ft. in length. The original intention was to use 70-lb. rails 33 ft. long, but the weight was changed in order to permit higher speeds, while the length was altered to save joints.

Owing to war conditions it has been impossible to secure the requisite material to build equipment suitable for the country traversed by the new line, which is warm in summer and cold in the winter months. For immediate purposes wooden bodies of the best design practicable will be built on such car underframes as are available in the Commonwealth. This equipment will consist of first and second-class sleeping cars, dining cars, day coaches and mail and baggage cars.

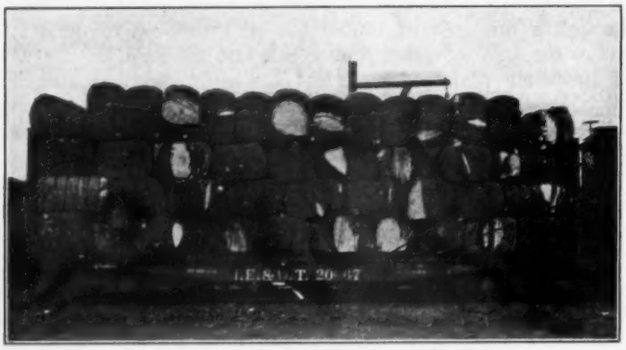
There will be 20 intermediate stations on the new road where postal, money order, savings bank and telegraphic business will be done. The line will be worked by the electrical staff, divided into 38 sections.

TRAIN RESTRICTIONS ON ITALIAN RAILWAYS.—Owing to scarcity of coal on the Italian State Railways, it was decided to cancel 173 trains commencing with November 25.

NEW TYPE OF LOCOMOTIVE IN NEW ZEALAND.—A new type of locomotive has been employed on the Woodville-Taihape section of the Main Trunk Railway of New Zealand during the past three months. The first of the class was constructed at the government workshops at Dunedin for service on the Canterbury Plains some two years ago. When tried over the level country between Christchurch and Oamaru the new engine gave such excellent results that it was decided to try it over the sharply graded section between Oamaru and Dunedin, and there again it satisfied all tests. Four of the new engines were sent to North Island some months ago and have been employed on the Wellington-Taihape section with good results. It appears that this engine can travel farther than the compound engine without taking in water, and that it has a greater hauling capacity. —*Commerce Report.*

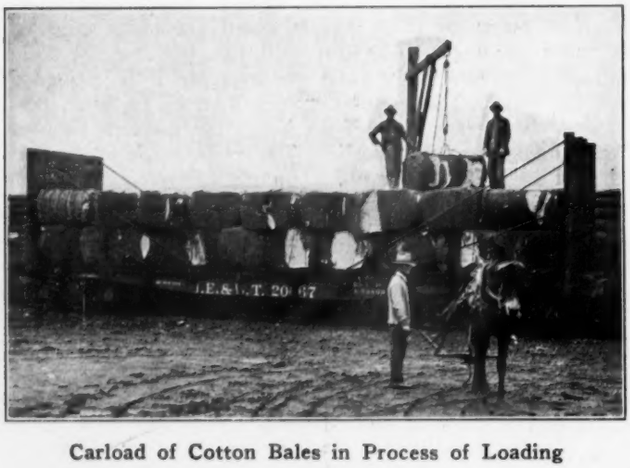
HEAVY LOADING OF COTTON

The Southern Pacific, Texas lines, is securing maximum carloads of cotton by the use of a small derrick and horse in loading. The flat car shown in the photographs which was originally fitted for the hauling of lumber, was loaded



Car Loaded with 86 Bales of Cotton

in this instance with 86 bales of flat cotton. The pictures were taken at Mabank, Tex., on November 28, 1917. In another instance a 50-ft. flat car was loaded with 110 bales



Carload of Cotton Bales in Process of Loading

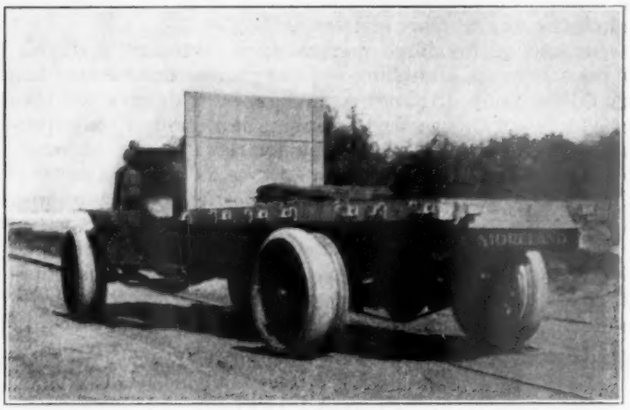
of uncompressed cotton without the aid of derrick and horse.

We are indebted to F. M. Lucore, assistant general manager of the Southern Pacific, Texas lines, for these two photographs.

RAILWAYMEN AT THE FRONT.—There are leagues of narrow-gage railways serving the British armies in Flanders and France. These are largely in the hands of Canadian and American railwaymen who have had special training. These railways are helping to beat the Germans, who never expected that the Allies would bring field transportation to such a high pitch of efficiency. The adaptability of the North American has made him invaluable as a railway pioneer at the front. In some sections the railways abandoned by the retreating Germans have been turned to good use against the enemy after suitable changes in gage. The "Sammies" on the firing line, under General Pershing, are not the first draft to reach the front. For more than two years American railwaymen have been running the risks of war, repairing and constructing railways under fire. So risky is this work that some of them have volunteered for the front trenches, preferring fighting risks to the fortunes of war on a railway section. Men from Ontario, Northwest Canada, and the United States have done a magnificent work as railway men.—*Toronto Globe.*

MORELAND AUTO-RAIL TRUCK

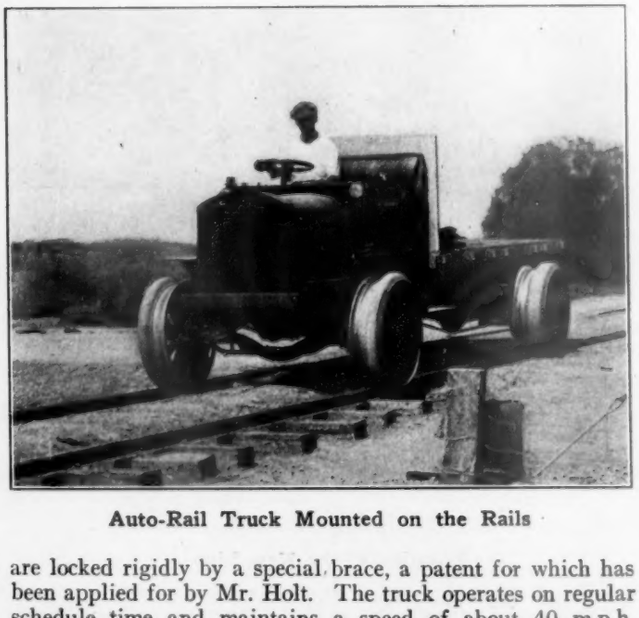
The automobile has become such an important factor in the trucking business in the Imperial valley of California that the Holton Interurban Railroad found that its business was falling off. The fact that the automobile would take material directly from the ranches to the market made it much more desirable for the farmers to use this service, as it eliminated the haul from the ranch to the freight station on the railroad. To meet this situation, W. F. Holt, who controls the Holton Interurban equipped a standard 2½-ton Moreland distillate truck with a motor truck wheel,



The Truck Leaving the Highway for the Railroad

designed by himself, which has steel flanges on the inner side and a solid rubber truck tire of larger diameter than the metal flanged portion, on the outer side in order that the truck can be used on rails as well as on the road, as the illustrations indicate. It is a simple matter for the car to mount the rails at any road crossing.

After the truck wheels are in place on the steel rails they



Auto-Rail Truck Mounted on the Rails

are locked rigidly by a special brace, a patent for which has been applied for by Mr. Holt. The truck operates on regular schedule time and maintains a speed of about 40 m.p.h. The difficulty of crossing switches and frogs has been overcome by still another device which is being patented.

WAR HONORS FOR BRITISH RAILWAYMEN.—Thirty-three men employed by the London, Brighton & South Coast Railway have been awarded war honors and decorations on active service.

General News Department

The Delaware, Lackawanna & Western has made an increase of 10 per cent in the pay of clerks in the auditing and car record departments. The Pennsylvania has made an advance in the pay of telegraphers, said to be of benefit to more than 1,000 men.

On the Buffalo, Rochester & Pittsburgh during Christmas week all agents, conductors and station and train baggagemen were instructed to accept U. S. Mail presented by the post office department at any station, on any train, and carry it to destination or junction point regardless of space or territory authorized.

Near Ruston, La., on December 23, a man named Causey flagged a passenger train of the Vicksburg, Shreveport & Pacific, brought it to a stop, and at once went into a coach and killed a passenger, against whom he had some grievance; and seriously wounded another man. At the next station Causey got off and surrendered to the sheriff.

William A. Christian, senior civil engineer, and T. F. Laist, senior architect, of the Division of Valuation, of the Interstate Commerce Commission, Central district, Chicago, have received commissions as majors in the engineering corps of the United States army. J. M. Kemmerer, office engineer at Chicago, has also received a commission as captain in the engineers corps.

At Magnolia, Md., on the Philadelphia, Baltimore & Washington, on the evening of December 22, six men waiting for a train were pushed by the crowd from the station platform on to the track and were killed by an express train. The crowd, a large one, consisted of contractors' employees who had been working for the government near Aberdeen and were waiting for a local train.

Of the 102 locomotives recently ordered sent from western lines to eastern roads to relieve the districts congested with freight, 39 were delivered at Chicago and 7 at St. Louis by December 21, 26 were en route at that time and 30 had not yet started for their destination. The expectations were that all of the engines would be delivered by December 25, except a few which are being transformed from coal to oil burners.

The Grand Trunk Literary and Scientific Institute is now 60 years old, and recently celebrated its anniversary. It was organized by F. H. Trevethick, a member of the distinguished family which included Richard Trevethick, who made the first high pressure steam locomotive. F. H. Trevethick, when he founded the institute, in 1857, was locomotive superintendent of the Grand Trunk. This movement led to the establishment of Grand Trunk Railway libraries at London, Stratford, Belleville, Lindsay and Battle Creek. The libraries are supported in part by a fund given to the railway company for that purpose, in 1860, by the Prince of Wales (King Edward).

Agnew T. Dice, president of the Philadelphia & Reading, has issued a call to employees of that road to stand by and do their share to the utmost. It speaks of the vital importance and urgent need of operating the road with the greatest possible efficiency and continues: "This result can be gained only through the giving by each man of the most efficient service of which he is capable. Railroad men may naturally be expected to set an example for other workers, and I am sure that each and every one of you will feel it to be a patriotic duty to lose no time from work and to give his best service of head, hand and heart. . . . Let every man feel that it is his patriotic duty to work and to cooperate with his fellows to the limit of his ability. Let us all face our difficulties with the determination to overcome them. . . ."

Officers of the Southern Pacific, testifying at an inquiry held by the California State railroad commission, recently said that the company had done its utmost to provide for the transportation needs of the public. Ten new locomotives have recently been delivered; ten more are being built in the company's shops, and others have been leased and borrowed. The company is building 3,200 cars in its California shops and has had 10,481 skilled workmen employed in maintenance of equipment work. It could use 500 more men if they could be found. F. E. Batturs, general passenger agent, said as war broke out, the company called meetings on all its divisions to see if any unnecessary passenger service could be eliminated, and it had been found that all of its trains were needed by the public; that the expeditious moving of the country's man power in time of war was as necessary as the prompt handling of freight, and that any attempt to lengthen the schedules of fast overland trains, such as the Overland Limited, would be interfering with the expeditious handling of Government mail, and a delay to business men.

The United States Fuel Administration has announced that it will not permit local officers to confiscate coal to meet local needs. The authority to commandeer and divert coal will be retained entirely in the hands of officers of the Fuel Administration. Director of Charities William Krusen, of Philadelphia, who took four cars of coal for local distribution without consulting the state fuel administration has been notified that further confiscations will not be permitted; and that they are unnecessary, provided he will advise the Washington office. At Toledo, Ohio, Judge John M. Killits, in the United States District, took similar action in a similar case. It was a suit of the Baltimore & Ohio against the Mayor of Lima. The temperature at Lima fell to 10 deg. below zero and the city took some cars from trains passing through. Judge Killits said: "Such officials ought to be taught to respect the law. They should come down off their high pedestals. They should try to cultivate amicable relations with the railroads. Their acts impede efforts to solve the coal distribution problem and thwart the railroads in their work of distributing coal where it is most urgently needed."

At Macon, Ga., recently a board of arbitrators decided in favor of the reinstatement of a locomotive engineer of the Georgia, Florida & Alabama who had been dismissed and whom the brotherhood demanded should be taken back; and a few days later the railroad company filed in the United States District Court a bill, taking exceptions to the findings of the board. The bill of exceptions avers that the arbiters were without jurisdiction to hear and determine the issues and that the Federal district court in which the bill is filed is without jurisdiction to render any judgment based on the award because the act of July 15, 1913, which authorizes mediation between railroads and their employees, does not cover the case in question. Strickland was not an employee of the road at the time of arbitration and even had he been, it is contended, the mediation act would not have applied in the case since this act is designed to cover only cases where matters of wages, hours of work and conditions of employment are concerned. Strickland, it is alleged, was discharged for infractions of the rules of the road and so the case in question is not among those provided for in the mediation act. Strickland was discharged by the road on August 5, 1916. The unions demanded his reinstatement, and in October an arbitration agreement was signed. Stanton J. Pelle, F. A. Burgess and J. C. Hale were the arbiters.

Trolley Car Disaster at Pittsburgh

In the derailment of a street car at Pittsburgh, Pa., December 24, at the foot of a steep descending grade, 19 passengers were killed and 80 or more were injured. The car became uncontrollable just after entering the tunnel, about a mile long, leading from the South Side at the center of the city, and ran uncontrolled to a curve at Carson street, at the lower end of the tunnel.

Hearing on Railway Situation

The Senate Committee on Interstate Commerce has announced a hearing on Saturday on the railroad situation. The members of the Interstate Commerce Commission are expected to be the first witnesses.

Engineers Wanted for the National Army

The War Department announces that volunteers are now being accepted for a provisional reinforcement railway regiment, for the National army, which is being organized at Camp Grant, Rockford, Ill. Men are wanted who have qualifications in railway construction, operation and maintenance; shop work and transportation. Applications are received at all of the principal recruiting stations.

Freight by Automobile from Detroit to Newport News

The train of 33 automobile freight trucks which is being run by the War Department from Detroit, Mich., to Newport News, Va., to facilitate the movement of government freight, delayed by the congestion on the railroads, and also as a means of training soldiers in the management of this kind of transportation, has made thus far about 50 miles a day; in other words, has accomplished about the speeds that were planned. The best day's run was 65 miles. In northwestern Ohio much snow was encountered. Near Warren, Ohio, on December 19, about 1 a. m., one of the trucks was wrecked at a crossing of the Erie Railroad, being struck by a passenger train and one of the two men in charge was killed. The other was badly injured.

Curtailment of Use of Private Cars

In compliance with the request recently made by the Railroads' War Board that the use of private and official cars be curtailed as much as possible during the war, Henry C. Frick, one of the largest railroad stockholders and a director of the Pennsylvania and the Atchison, Topeka & Santa Fe, has ordered his private car, the "Westmoreland," dismantled and laid up for the duration of the war. The War Board has since requested the presidents of the Trunk Line roads to withdraw the tariffs covering the movement of private passenger cars.

$250 for the Railway Regiments' Tobacco Fund

The Railway Regiments' Tobacco Fund received another big boost last week when the New York Railroad Club, on the motion of Daniel M. Brady, voted to give $250 to the fund, $250 to the Y. M. C. A., $250 to the Knights of Columbus and $250 to the Red Cross.

Other contributions were received last week as follows:

American Car & Foundry Company, New York, $50; Damascus Brake Beam Company, Cleveland, $25.

Iowa Defense Council Praises Railways

The Iowa State Council of National Defense has issued to shippers and receivers of freight a circular commending the patriotism of the officers of the railroads who have released many of their best employees to go to France and Russia and have also organized from their employees companies of engineers for service abroad. The circular says: "They have co-operated in every way with each other, diverting business from the companies which could obtain it to the companies which could handle it most efficiently. They have sought to attain the greatest degree of efficiency in transportation for the benefit of the country, regardless of the effect upon the individual companies. Their credit has been so greatly impaired that they cannot borrow money except at ruinous rates, but they have nevertheless greatly increased the amount of their transportation of passengers and freight. . . ."

Christmas on the N. C. & St. L.

President John Howe Peyton of the Nashville, Chattanooga & St. Louis, has issued a Christmas greeting to the employees in which he says:

"The joyous Christmas-tide is again at hand, and we should all remember that it is the annual reminder to all the earth that Christ, the Son of God, chose at this season to be born in the form of humanity, in order that He might work out the salvation of our race. With the whole earth at war this is no time for merriment, but I can and I do wish you all a 'happy' Christmas. Happiness is only possible to those who try to do their duty to God and men. * * * The future of our nation, and of the whole human family, is threatened with great suffering and privation. We will meet the emergencies like true men, and we will do our duty at any cost. We must, each and all, volunteer for the war. Some of us must become soldiers and offer our lives to preserve liberty upon the earth. Some of us must sacrifice our leisure to produce more food, and all of us must economize by consuming less food. All of us must sacrifice our pleasures in order to save money to loan to the government. Let us rejoice because Christ was born in Bethlehem nineteen hundred years ago, and let us imitate Him by sacrificing ourselves for the cause of liberty, justice and righteousness upon the earth."

Creosote Oil Imports

The imports of creosote oil in the United States during the fiscal years ending June 30, 1916, and 1917, as compiled by the Bureau of Foreign and Domestic Commerce, were as follows:

	1916		1917	
Source	Gallons	Value	Gallons	Value
England	34,616,238	$2,763,078	25,782,272	$1,920,446
Scotland	505,346	62,285	206,012	30,270
Canada	3,746,192	272,273	3,089,754	233,853
Japan	1,630,616	109,144	.....	.....
	40,498,392	$3,206,780	29,078,038	$2,184,569

From these figures there is shown a decrease of 11,420,354 gal., the larger part of which results from the heavy falling off in importations from England and the suspension of shipments from Japan. The average invoiced value of all creosote importations last year was 7.2 cents per gal. as compared with 7.9 cents in 1916.

Grand Trunk Safety Bulletin

The Safety Engineer of the Grand Trunk issues his December bulletin (No. 15) with decorations of holly and other embellishments; and illustrates one of his chief points by a picture of a barrel tipping over the brink of Niagara Falls. In this connection he says:

"Would you go over Niagara Falls in a barrel? *I should say not.* That's a funny question to put into a Safety Bulletin. What are you driving at anyway? *Just this:* Scores of you men every day are taking chances that are just as unnecessary, just as foolish and just about as risky as going over Niagara Falls in a barrel; and if you could read the reports in my office showing how Grand Trunk men get injured and killed, you would agree with me."

The introduction to the bulletin reads

> You fellows who have never been hurt—and who probably think you never will be—who look on this "safety first dope" as good stuff for the other fellow—you are the individuals this Bulletin is aimed at. I want you to quit flirting with Carelessness and get into the Safety Corral before your name comes floating into my office on one of those long pink sheets.

The safety engineer finds that three causes alone are responsible for more deaths to Grand Trunk men than all other causes combined: (1) Run over by cars or engines; (2) Falling from cars or engines; (3) Train or yard men working on cars which are moved by another engine working on same track.

Individual Christmas Boxes Sent to Railway Men in France

With contributions by employees of the Illinois Central, the Yazoo & Mississippi Valley and the Chicago & North Western individual Christmas boxes were sent to former employees of those roads now in active military service in France. Charles H. Markham, president of the Illinois Central system, addressed a personal letter to each Illinois Central soldier in France, sending it with the box. Every box contained the following articles: One box of cigars, 20 packages of cigarettes, 20 packages of cigarette papers, 20 boxes of smoking tobacco, one pound of chewing tobacco, one automatic cigar or cigarette lighter, one pipe, one package of pipe cleaners, two tooth brushes, two packages of tooth paste, five pounds of candy, three bars of soap, 10 packages of chewing gum, three pairs of woolen hose and one woolen vest.

The North Western Christmas boxes were purchased, packed and sent at an expense of $1,247. There still remains a balance of $3,895 of the fund contributed by employees and officers of the company. Each box which was sent to members of Company E of the Thirteenth Engineers, the North Western unit in France, contained one pound of assorted candy, one package of mints, three packages of gum, six packages of licorice, one pipe.

200 cigarette papers, 12 pipe cleaners, 20 packages of smoking tobacco, one pound chewing tobacco, 10 packages of cigarettes, 25 cigars, one indelible pencil, one cigar lighter and a set of writing tablets and envelopes. In addition, a box for general distribution was sent to the company containing baseball equipment, 40 decks of cards, 48 puzzles, 12 mouth organs, four yearly subscriptions to the *Railway Age Gazette* and a miscellaneous assortment of magazines.

Mr. Markham's letter expressed the pride felt by the men at home in their co-workers' response to the call of their country, and confidence that "any task which may be assigned to Illinois Central and Yazoo & Mississippi Valley men will be promptly and efficiently performed."

Appeal to Lehigh Valley Employees

E. E. Loomis, president of the Lehigh Valley, has issued a letter to employees suggesting that possibly they do not realize what a necessary factor the railroads are in the winning of the war. "They are literally the backing of the men in the American camps and the French trenches. Without their faithful service, the courage and endurance of the bravest troops become useless. This is so true that railroad men unwilling at this time to give to their work the best that is in them, are actually slackers. . . . *There must be no slackers among us.* Every man must stick to his job in these troublesome days. It is a time for self-sacrifice. This means working thirty days a month, if necessary, regardless of weather conditions; losing no time after pay day; assisting, each in his place, in running this railroad at the highest point of efficiency. . . . I call upon you all to enlist heart and soul in this patriotic service."

Coal Production

According to the weekly bulletin of the Geological Survey, zero weather and a heavy fall of snow impeding railroad traffic and surface operations at the mines caused coal production during the week ended December 15 to drop to the lowest point recorded since the weekly bulletins were begun. The average daily production was 1,402,594 tons. The lowest mark reached before since June 1 was 1,638,513 tons, in the week ended August 18, at the time of the coal strikes in Illinois and the southern Appalachians. Anthracite shipments fell off 22 per cent. Bituminous shipments originated on 114 roads amounted to 147,590 carloads. The percentage of full-time output produced during the week ended December 8 was 73.6 and 19.3 per cent of the loss was attributed to car shortage. The bulletin says:

"Illinois and Indiana exhibited little change. In Ohio, losses due to no cars increased from 25.2 to 31.7 per cent of the full-time capacity. Conditions in western Pennsylvania, on the other hand, improved greatly. In central Pennsylvania, losses due to inadequate transportation increased. On the West Virginia fields, the Panhandle, Fairmont, and Cumberland-Piedmont experienced relief from the shortage of the week before. In the remaining fields, losses due to car shortage were even more severe than during the preceding week; in the high-volatile field of southern West Virginia, particularly, they amounted to 56.9 per cent of the full-time output.

"A study of these bulletins will reveal that the dominant factor limiting production is lack of transportation. As long as the soft coal mines of the country are idle from one-seventh to one-fifth of the time because there are no cars at the tipple, more laborers could add but little to the output. It should, however, be remembered that the railroads are already carrying more coal than ever before in the history of the country. The production of bituminous coal during the month of November was, with one exception, the largest in any one month in the history of bituminous coal mining in America."

The monthly bulletin of the Geological Survey for November gives a preliminary estimate of the output for that month of 47,747,000 net tons. The average production per working day during the month was 1,872,432 tons, as compared with 1,757,336 tons in October. The November rate has been exceeded only once in the last two years, when in February, 1916, the average production per working day rose to 1,882,771 tons.

The cumulative production from January 1 to November 30, 1917, came within 427,000 tons of equalling the entire 1916 output. Up to November 30, 1917, the country is estimated to have produced 502,091,000 tons. The entire output of the year 1916 was 502,519,000 tons. The country may thus be said to be one month ahead of its 1916 performance. If the present rate of production be maintained, the total output for 1917 will better the record of 1916 by 9 per cent.

A. W. Thompson, chairman of the General Operating Committee of the Eastern Railroads has been co-operating actively with the Fuel Administration to promote an increased movement of coal and recent reports have indicated a marked improvement in some districts.

Railway Returns for October

The Interstate Commerce Commission has issued its monthly bulletin of railway earnings and returns for October. Railway operating revenues for the month amounted to $380,951,970 as compared with $338,666,230 in October, 1916. Operating expenses increased from $210,295,841 to $259,017,248. Taxes increased from $13,898,678 to $21,910,588, so that the railway operating income was only $99,926,889 as compared with $114,431,497 in October, 1916, a reduction from $496 to $432 per mile of line. The operating ratio was 67.99 in October, 1917, as compared with 62.10 in October, 1916. The railroads in eastern, southern and western districts all show increases in operating revenues for the month and decreases in the operating income. In the case of the eastern roads, the reduction in the latter item amounted to nearly $7,000,000, and in the case of the western lines to over $7,000,000, while for the southern lines it was about $100,000.

For the ten months ended with October, railway operating revenues amounted to $3,350,721,651 as compared with $2,991,462.057. Railway operating income was $835,377,303 as compared with $899,792,922, a reduction of nearly $300 per mile. The operating ratio was 69.87 as against 65.52. For the 10 months the eastern roads show a reduction of $62,000,000 in operating income, the southern roads show a gain of nearly $2,000,000 and the western roads show a loss of over $4,000,000.

A notable feature of the report is the increase in passenger revenues, which for October was $15,000,000 or nearly 20 per cent. For the 10 months passenger revenues increased approximately $90,000,000 or 15 per cent, while the freight revenues increased about 10 per cent.

Inefficient Watchmen

From an address by General Manager Mallalieu, of the National Board of Fire Underwriters at a recent convention in New Orleans we take the following observations on the danger of retaining superannuated employees:

The custom among manufacturers, warehousemen and others is that of engaging as night watchman some superannuated employee who is no longer physically able to earn a workman's pay. The amount of real protection which he furnishes, especially in war time, is very small. Generally he can be avoided with ridiculous ease by any one who is in the place with hostile intent. In a recent test in a large grain elevator, six inspectors were sent into the plant at night time, without the knowledge of the aged watchman, and they spent six hours within the plant and made drawings of many of its important features, but their presence was never once detected. As a consequence the owners were given the alternative of engaging a sufficient number of young and vigorous guards or of having their plant taken over by the state authorities.

The big Baltimore fire of October 30 is a striking example of insufficient watchman service. Here was a pier, 900 feet long, containing a valuable accumulation of freight, left in the sole charge of a single watchman! To make the safeguarding of our production of war supplies depend upon those who can furnish only nominal safety, during the hours when darkness brings the greatest dangers, would be ludicrous if it were not so grave. It is equivalent to locking the windows and leaving the front door open. Watchmen should be picked men, not derelicts. They should be intelligent ,courageous and physically active. They should be sufficient in number to furnish real protection. They should be armed. They should be trained in knowledge of fire alarms, fire prevention and fire protection. They should never be engaged except upon unmistakable evidence of character, and they should be paid the salaries that will command such qualifications.

The Wood Preservers' Convention

At a meeting of the executive committee of the American Wood Preservers' Association in Chicago on December 17, it was decided to proceed with the original plans for the fourteenth annual meeting of that association, which will be held at Chicago on January 22 to 24, inclusive. The advisability of postponing this convention or of omitting it entirely this year was given careful consideration, but it was decided that the importance of the conservation of timber and the unusual character of the new problems presented to this industry by the war made the exchange of information more than usually desirable. It was decided to limit entertainment to an informal dinner on Wednesday evening, which will be patriotic in character.

The tentative program so far as has been arranged is as follows:

TUESDAY MORNING.

Convention called to order at 10 a m.
President's address.
Reports of committees.
Report of secretary-treasurer.
Communications.

TUESDAY AFTERNOON.

Report of Conference Committee
Report of Committee on Publicity, Promotion and Education.
Report of Committee on the Purchase and Preservation of Treatable Timber.

WEDNESDAY MORNING.

Report of Committee on Service Tests.
(a) Ties and Structural Timber.
(b) Flooring and Paving
Report of Committee on Plant Operation.
Report of Committee on Preservatives.

WEDNESDAY AFTERNOON.

Report of Committee on Wood-Block Flooring and Paving.
Report of Committee on Non-Pressure Treatments.
Motion Picture Exhibit of the Manufacturing of Iron Pipe.

WEDNESDAY EVENING.

Annual Dinner.

THURSDAY MORNING.

Report of Committee on Terminology.
Report of Committee on Publications.
Closing Business.
Election of Officers.

In addition to the reports of committees arrangements are being made for a number of prominent men in the field of timber preservation to present individual papers upon important problems in this industry which are now of special interest.

A. R. E. A. Nominations

The nominating committee of the American Railway Engineering Association has nominated the following candidates for officers in that association for the ensuing year:

President, C. A. Morse, chief engineer, Chicago, Rock Island & Pacific, Chicago.

Vice-president, H. R. Safford, chief engineer, Grand Trunk, Montreal, Canada.

Treasurer, Geo. H. Bremner, district engineer, Division of Valuation, Interstate Commerce Commission, Chicago.

Secretary, E. H. Fritch, Chicago.

Directors (three to be elected): J. L. Campbell, engineer maintenance of way, El Paso & Southwestern, El Paso, Tex.; J. E. Crawford, chief engineer, Norfolk & Western, Roanoke, Va.; J. M. R. Fairbairn, assistant chief engineer, Eastern Lines, Canadian Pacific, Montreal, Canada; E. A. Frink, principal assistant engineer, Seaboard Air Line, Norfolk, Va.; John V. Hanna, chief engineer, Kansas City Terminal, Kansas City, Mo.; E. H. Lee, vice-president and chief engineer, Chicago & Western Indiana, Chicago, Ill.; H. T. Porter, chief engineer, Bessemer & Lake Erie, Greenville, Pa.; E. B. Temple, assistant chief engineer, Pennsylvania Railroad, Philadelphia, Pa.; F. E. Turneaure, dean, College of Engineering, University of Wisconsin, Madison, Wis.

Members of nominating committee (five to be elected): J. E. Crawford, chief engineer, Norfolk & Western, Roanoke, Va.; Arthur Crumpton, assistant valuation engineer, Grand Trunk, Montreal, Can.; B. J. Dalton, chairman valuation committee, Missouri, Kansas & Texas, Parsons, Kan.; H. T. Douglas, Jr. chief engineer, Chicago & Alton, Chicago; John V. Hanna, chief engineer, Kansas City Terminal, Kansas City, Mo.; A. J. Himes, valuation engineer, New York, Chicago & St. Louis, Cleveland, Ohio; J. B. Jenkins, valuation engineer, Baltimore & Ohio, Baltimore, Md.; J. A. Peabody, signal engineer, Chicago & North Western, Chicago; A. R. Raymer, assistant chief engineer, Pittsburgh & Lake Erie, Pittsburgh, Pa.; J. E. Willoughby, chief engineer, Atlantic Coast Line, Wilmington, N. C.

Association of American Railway Accounting Officers

The Standing Committee on Freight Accounts, in view of the shortage of man power on account of the war, and as a means of relieving the congestion in local agencies and in audit office settlements among carriers, has recommended the establishment of a $1 minimum; in other words the committee recommended that the association's 25-cent correction minimum be changed to read items of less than $1.

No June Mechanical Conventions

At the meeting of the executive committees of the Master Car Builders and the American Railway Master Mechanics' Associations in New York December 20, it was decided in view of the present state of affairs to hold no convention in June, 1918. If conditions warrant, however, a business meeting may be held in Chicago sometime during the year.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings and places of meetings of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next annual meeting, March 20-22, 1918, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, Supt. Timber Preservation, B. & O., Mt. Royal Sta., Baltimore, Md. Next convention, January 22-24, 1918, Hotel Sherman, Chicago.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Morrison Hotel, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual dinner, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

CINCINNATI RAILWAY CLUB.—H. Boutet, Chief Interchange Inspector, Cin'ti Rys., 101 Carew Bldg., Cincinnati. Regular meetings, 2d Tuesday, February, May, September and November, Hotel Sinton, Cincinnati.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 568 Union Arcade Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month. Room 1856, Transportation Bldg., Chicago.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, 149 Peoples Gas Bldg., Chicago. Annual exhibition, March 18-21, 1918, Coliseum and Annex, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—Geo. A. J. Hochgrebe, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PACIFIC RAILWAY CLUB.—W. S. Woolner, Assistant to Chief Engineer, Northwestern Pacific R. R., San Francisco, Cal.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—F. C. Stewart, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Pittsburgh Commercial Club Rooms, Colonial Annex Hotel, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Myers Bldg., Bethlehem, Pa. Next meeting, March 18, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grand Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 a. m., Piedmont Hotel, Atlanta.

TRAFFIC CLUB OF CHICAGO.—C. B. Singer, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Monday in month, except June, July and August, Hotel Sherman, Chicago.

WESTERN SOCIETY OF ENGINEERS.—Edgar S. Nethercut, Secretary, 1735 Monadnock Block, Chicago, Ill. Regular meeting, first Monday in month, except January, July and August. Extra meetings generally on other Monday evening except in July and August.

Traffic News

The Central Passenger Association roads will discontinue deliveries of passenger and sleeping car tickets to patrons, beginning January 1.

The embargo which was placed on the movement of corn, oats, kaffir corn and milo maize into and east of Chicago on December 5, was canceled on December 20.

The Wabash will on December 30 discontinue its passenger train leaving St. Louis for Chicago at 9:01 a. m. and the train leaving Chicago for St. Louis at 9 a. m.

The Chamber of Commerce of Houston, Tex., has established a bureau, in charge of F. A. Leffingwell, to aid shippers and consignees in securing prompt adjustment of overcharges and other claims against railroads.

The Delaware, Lackawanna & Western has filed with the Interstate Commerce Commission a tariff making an increase of 10 cents a ton in the freight rate on small sizes of anthracite coal from the mines to Tidewater.

The Delaware, Lackawanna & Western announces in New York City that some of the suburban passenger trains in the non-rush hours will be discontinued December 31; and the consequent saving in coal is estimated at 1,000 tons a month.

Union Pacific has announced that hereafter it will pay refunds to passengers on its extra fare train between Chicago and San Francisco at the rate of a dollar for each hour the train is late when the train is two hours or more behind schedule. No refund will be paid exceeding 50 per cent of the extra fare.

The New York, New Haven & Hartford, during the eleven months ended November 30, moved 390,505 tons more of commercial coal over its lines than in the same period of 1916. Of this increase the larger part was anthracite. Total movements for eleven months were 6,437,974 gross tons, compared with 6,046,469 gross tons in 1916.

The United States Food Administration announces that Lester Brothers, wholesale food handlers of Newport News, Va., have been deprived of their license, and ordered to close their doors on December 31. They had refused consignments of potatoes, allowing them to deteriorate in the freight yards and incidentally to add to railroad congestion.

The Southern Railway early in January will send its live stock and dairy instruction cars for a tour over the line in Georgia between Macon and Brunswick. Agricultural agents of the road's development service will be assisted by representatives of the state department of agriculture. The subjects to be treated will include horticulture, methods for the control and extermination of the boll weevil, and information on the growing of fruits and vegetables and forage and pasture crops.

The Secretary of War, in a public statement announcing that camp commanders had been told to discourage the granting of unusual numbers of furloughs to the soldiers at holiday time, says that the principal reason is that the transportation facilities of the country were taxed to their utmost for weeks in bringing to the mobilization points the hundreds of thousands of men now there and in making the necessary transfers of men and materials between those points. "To add to the burden of carrying great numbers of these men to their homes from the camps and back again to the camps would be a burden insupportable," he said. "The relieving of the railroads from this burden will enable us by so much to concentrate our energies and capacities for the transportation of our resources to the seaboard and to the battlefront in France."

At the suggestion of the traffic officers of the southeastern lines at a recent conference, the Railroads' War Board has appointed a committee, to be known as the South Atlantic and Gulf Export Committee, for the purpose of co-operation with the authorities of the United States and allied governments in the movement of traffic exported directly or indirectly via South Atlantic and Gulf ports. The committee consists of C. T. Airy, Central of Georgia, chairman; R. A. Brand, Atlantic Coast Line; F. B. Bowes, Illinois Central; C. R. Capps, Seaboard Air Line; Lincoln Green, Southern; A. R. Smith, Louisville & Nashville, and W. A. Winburn, Central of Georgia. The chairman is to act as traffic manager, with headquarters at Washington, to make such distribution of the freight as will prevent congestion. The organization of a similar committee for the management of freight through Texas ports has been suggested.

Embargo on Corn and Oats Lifted

United States Food Administrator Hoover has notified corn and oats millers in the central and eastern states—east of Wisconsin and Indiana and north of the Potomac and Ohio rivers—that the zonal embargo on the shipment of corn and oats into or through that territory, which went into effect on December 8, is being taken off. Corn and oats users are urged not to buy or ship more corn or oats than they can at once discharge and not more than requirements from week to week until congestion is relieved. Otherwise railways may be forced to place special embargoes on plants at fault in this particular.

The Example of the Dining Cars

The railway dining car services of the country have reported to the United States Food Administration that during the months of October and November they saved, of

Meats	234 tons
Wheat flour	1,214 bbls.
Sugar	12½ tons

These savings were made despite an increase of twenty per cent in the number of persons fed, as compared with the corresponding two months of the previous year.

Railroads Urge Curtailment of Christmas Travel

The Pennsylvania and the Southern last week advertised in the daily papers appealing to people not to travel during the Christmas holidays, except there be urgent necessity, "to the end that the soldiers on furlough and persons who must travel may do so with a minimum of inconvenience." The advertisement says:

"Every year the normal travel is greatly increased during the holiday season. This year it will be swelled by the return to their homes for Christmas of a large number of the troops now in camp. Furthermore, an extraordinary current traffic in military supplies, fuel and necessary commercial freight may be expected, during the holidays, to limit our ability to provide comfortable passenger transportation."

The Southern has also announced the curtailment of New York sleeping car service, noticed on December 14, page 1102, and says that some of its through trains will not be held at Washington for connections from the east, but will depart on time, and will be limited to their present capacity.

KEEPING TRAINS FROM BEING BLOWN OFF TRACKS.—There is a stretch of railway along the west coast of Ireland where it was formerly not an uncommon occurrence for the trains to be blown from the rails by the winds from the ocean, says the Popular Science Monthly for December. These disasters are now prevented by the use of an ingenious form of anemometer which rings an alarm bell when the velocity of the wind reaches sixty-five miles an hour. Each station on the line keeps on hand a stock of movable ballast, a ton of which is placed aboard every car arriving at the station after the bell sounds.

RAILWAY FACILITIES AND INCOME.—Increased railway facilities are a personal necessity to many of us; they are a national necessity. We need both tracks and equipment vastly in excess of the present supply. This is not a time to debate as to the best source of money for supplying railway needs, the return on the investment, etc. We know that the railway should be in a position to pay the same rate of interest on the money it requires as would any business of equal safety or risk, no matter from what source it borrows. The railways are not paying that interest now and can only and should only get capital when they can vouch for an adequate return. An increase of income is the *sine qua non* of the present railway situation.—*Engineering and Mining Journal.*

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The Commission, Division No. 2, has issued an order providing that railroads may file tariff publications covering changes in the dimensions, capacity and number of cars, substitution of new cars for old and corrections in the number, capacity or dimensions of cars without formal hearing. The commission says that these changes are of almost daily occurrence and it is important that shippers be advised of them promptly.

The commission, on December 20, announced the suspension until June 30, 1918, of the tariffs involved in the eastern commodity rate case. These rates were suspended on August 28 until December 30, and have since been consolidated with the supplemental 15 per cent case, in which the decision has not yet been rendered. The further suspension of the rates would seem to indicate that the commission does not expect to issue a decision in the 15 per cent case before December 30.

Private Car Investigation Reopened

The Interstate Commerce Commission has announced the reopening of its investigation of the relations between railroads and shippers and private car lines, which was begun in 1913, but in which no report was made. The commission says that conditions have undergone material changes, and it is advisable that the evidence and statistical data heretofore submitted be brought down to date. It is proposed also to secure such further evidence as may be necessary to show the relation between private car companies and rail carriers; to determine whether it is proper, where special equipment is supplied by carriers, that a service charge, in addition to the rate of transportation, be assessed; and the amount of such charge if one is to be made; and to ascertain in case a carrier has no equipment of the kind demanded by a shipper, whether it should secure the same, or whether the shipper should be permitted to make his own arrangement.

The inquiry will further consider (a) whether if private car owners are to be permitted to continue to furnish cars and make charges direct to the shipper, a tariff should be filed.

(b) What compensation should be paid by carriers to the car owner.

(c) What relation investment in private cars, cost of operation, maintenance and depreciation, and loaded and empty per car-mile freight earnings, should bear to the rental to be paid by the carrier.

(d) Whether charges for refrigeration should be a stated sum for the service, in cents per 100 lb. of freight hauled, or be based on the cost of service.

(e) Rules and practices respecting icing and re-icing.

(f) Rules and practices of defendants as to mixtures, minimum weights and charges, part-lot shipments, return of empty containers, etc.

(g) Demurrage charges on private cars.

(h) Whether the M. C. B. rules with respect to private cars should be filed with the commission.

The case is set for hearing before Examiner George N. Brown at the Sherman Hotel, Chicago, February 4.

STATE COMMISSIONS

The Public Utilities Commission of Colorado, in view of the added demands which the war has made upon the railroads, has reduced its annual report requirements for the calendar year 1917 and now orders that carriers may discontinue the rendering of monthly passenger train movement reports. The last report to be filed will be that for the month of December.

The Public Utilities Commission of Colorado, reporting a case which was decided October 27, announces that it has permitted the Crystal River & San Juan Railroad to discontinue operation of trains on its line, seven miles long, until April 1 next. This road, about 30 miles south of Glenwood Springs, served the Colorado Yule Marble Company; that company has apparently failed and a large portion of the population has moved away. The order of the commission forbids the railroad company to carry off its railroad, or any part thereof.

COURT NEWS

Consignee's Liability for Freight Charges

The Pennsylvania Superior Court holds that a consignee of lumber who refuses to accept delivery because the lumber was not of the kind he ordered will not be relieved from the transportation charges. He must look to the consignor to recover for any loss sustained because of any defect in the goods consigned.—P. & R. v. Parry, 66 Pa. Superior Ct. 49. Decided March 13, 1917.

Contributory Negligence of Trackman

A trackman, after seeing an express approaching at 50 or 60 miles an hour, decided he could strike a few more licks at his work and then avoid injury, and attempted to do so. He was struck by the pilot beam of the locomotive and killed. The Arkansas Supreme Court holds that he was guilty of contributory negligence as matter of law, barring recovery for his death.—Tyler v. St. Louis, I. M. & S. (Ark.), 198 S. W., 128. Decided October 29, 1917.

Remedy for Refusal of Through Bill-of-Lading

The Circuit Court of Appeals, Eighth Circuit, holds that a bill to compel a railroad company to issue a bill of lading requiring it to carry and deliver at a place on the line of another road a single carload of wheat owned by the complainant, does not state a cause of action within the jurisdiction of a federal court of equity, there being an adequate remedy at law by an action for damages, which were easily ascertainable.—Northern Pacific v. V. D. Harrington Co., 245 Fed., 454. Decided July 2, 1917.

Crossing Accidents—Contributory Negligence

The Oregon Supreme Court holds that safety to the public and travelers on trains requires that a person driving an automobile over a crossing should look carefully upon the track itself where a train may be expected, if there be opportunity so to inspect the situation; and the motorist who neglects this duty is negligent as a matter of law. The driver of a motor truck approaching a crossing, whose hearing was interfered with by the ringing of the bell on a standing locomotive, went forward experimentally and collided with a switch engine on the next track. It was held that he was negligent and judgment for the plaintiff was reversed and the cause remanded with directions to enter judgment of nonsuit for the defendant.—Cathcart v. Oregon-Washington R. & Nav. Co. (Ore.), 168 Pac., 308. Decided November 6, 1917.

Prohibitive Rates Not Necessarily Unlawful

The Pennsylvania Superior Court holds that the fact that a rate is prohibitive does not make it *per se* unlawful. There are many elements which may enter into the fixing of a rate, such as the factor of distance, ton-mile revenue, car-mile revenue, earnings per car, and a comparison of the rates on other commodities of equal or higher value, the volume of movement, the value of the service to the shipper or consignee, and the cost of service. When all or some of these matters, and possibly others, are taken into consideration it does not follow that they will always result in the fixing of rates that will make it profitable for every shipper to use the means of transportation. His need may be a factor to be considered, but it is not a determining one. The fact that traffic does not move is not conclusive that the rates are not reasonable.

It was also held, on appeal from an order of the Pennsylvania Public Service Commission adopting the rates suggested by the complainant, a shipper of building sand, in a proceeding against a railroad company, that it was not proper for the commission to fix a rate for a route of a mileage of thirteen miles on a basis of what the rate should be on a route of 7.6 miles, when it did not appear that the shorter route was available, or that the carrier whose road comprised part of the shorter route was

a party to the proceedings.—McCrady Bros. Co. v. P. & L. E., 66 Pa. Superior Ct., 307. Decided March 16, 1917.

Provision in Bill of Lading as to Measure of Damages

The Kansas Supreme Court holds that a provision in a bill of lading that the amount of any loss or damage for which the carrier was liable shall be computed on the basis of the value of the property (being the bona fide invoice price, if any, to the consignee, including the freight charges, if prepaid) at the place and time of shipment, is reasonable and valid, and intended merely to establish a rule for determining the value of the property in case of loss, and not to limit or diminish the carrier's liability. In an action for damages for failure to deliver a shipment of wheat it was held that such a provision in the bill of lading precluded the recovery of the shipper for the difference between the market value of wheat at the place of delivery and the contract price at which the shipper had sold it after the original purchaser had declined to receive it. The measure of damages was held to be the difference between the price which the wheat sold for at the place where it was delivered and the invoice price or fair market value at the point and time of shipment.—Wallingford v. Atchison, T. & S. F. (Kan.), 167 Pac., 1136. Decided October 6, 1917.

Employees' Authority to Hire Physician

In an action by a physician against a railroad for services rendered to an employee of the defendant, who had been severely injured, but not in the course of his employment, having lain off for the day from his duties on grading work, it appeared that the plaintiff had been employed by an assistant engineer of the defendant. The Iowa Supreme Court holds that an assistant engineer, in charge of grades and bridges, with power to hire and discharge men, and hire physicians, in the absence of company physicians, to care for injuries, has no implied authority to employ a physician to treat or operate on an employee injured while not engaged in the line of his duty or service and within the scope of his employment. The duties of an assistant ordinarily are circumscribed, and the circumstance of being "assistant" puts all on inquiry as to the scope of his activity in helping another or others. It has been held that authority to employ a physician is not to be inferred from the mere fact that an employee is roadmaster, or a conductor, or a foreman, or a yardmaster, or a general surgeon.—Carson v. Chicago, M. & St. P. (Iowa), 164 N. W., 747. Decided October 20, 1917.

Assault and Robbery in Crowded Car

The North Carolina Supreme Court holds that a railroad is not liable to a passenger assaulted and robbed on its train, although the cars were without light and badly overcrowded, where there was no causal connection between the road's supposed negligent act in overcrowding and failing to light its cars and the injury charged to have resulted therefrom. The court quoted Lord Selborne, then Lord Chancellor (1894) in the English case of Cobb v. Railroad Co., App. Cases 424, an action to recover damages from a railroad company for a sum of money which the plaintiff alleged had been taken from his person by robbery as a consequence of the company's negligence in allowing the carriage to be overcrowded, as follows: "I do not think it necessary to say more than that, on the plaintiff's pleading, it is not shown that the overcrowding of the carriage did in fact conduce in any way directly or indirectly to the robbery; and on the assumption that, under some possible circumstances, this might have been actionable negligence, it would, in my judgment, be indispensable, for that purpose, to state and prove some actual connection between the overcrowding and the loss. It is not, in my opinion, enough to suggest (as the plaintiff does) that to suffer such overcrowding was to 'facilitate the hustling and robbing of the plaintiff.' As the case is stated by him, nothing turns upon the fact that the robbery was committed by a gang of more than nine persons." In the present case the court said that the assault was not described with any particularity so that the court could understand how it came about, and seemed to be only the pleader's conclusion as to its character and not a statement of the facts. For this reason it held the case should have been dismissed, and reversed a judgment for the plaintiff.—Chancey v. Norfolk & Western (N. Car.), 93 S. E., 834. Decided October 17, 1917.

Equipment and Supplies

FREIGHT CARS

THE LESH OIL COMPANY, Kansas City, Kan., is inquiring for 10 8,000-gal. capacity tank cars.

THE PRODUCERS AND REFINERS CORPORATION, Tulsa, Okla., is inquiring for 20 8,000-gal. capacity tank cars.

THE PRUDENTIAL OIL CORPORATION has ordered 50 tank cars from the Standard Car Construction Company.

THE GREAT WESTERN CONTRACTING COMPANY has issued inquiries for 30 8,000 and 10,000-gal. tank cars.

THE PENNSYLVANIA SALT MANUFACTURING COMPANY, Philadelphia, has issued an inquiry for 5 acid tank cars.

THE MIDLAND REFINING COMPANY, Eldorado, Kan., is inquiring for 15 to 40 8,000-gal. to 10,000-gal. capacity tank cars.

THE OIL, GAS & LEASE COMPANY, Ardmere, Okla., is inquiring for 20 8,000-gal. and 10 10,000-gal. capacity tank cars.

THE EASTERN REFINING COMPANY, Oil City, Pa., has ordered 20 8,050-gal. capacity tank cars from the Pennsylvania Tank Car Company.

SIGNALING

THE PIEDMONT & NORTHERN has ordered from the Union Switch & Signal Company the materials for two small temporary interlockings at the entrances to the national cantonment at Camp Greene, Charlotte, N. C. Each plant includes a three-lever dwarf machine, and the signal indications will be controlled primarily by knife switches and selected over circuit controllers on the levers of the machine.

THE ATCHISON, TOPEKA & SANTA FE has ordered from the Union Switch & Signal Company the signals to be used on the Richmond-Fresno, Cal., section; 50 style "S," three-position, low voltage, D. C. double case ground signals, and 50 single case bridge signals of the same type. The Union company has also received a contract to furnish 49 style "S" ground signals for the Goffs-Bagdad division of the Santa Fe.

THE PENNSYLVANNIA is to install three electro-pneumatic push-button machines at Hackensack Meadows, between Jersey City, N. J., and Newark; at "MV" cabin a 48-unit machine for the western receiving yard; at "CA" cabin, a 36-unit machine; and at "MW" cabin, located at the eastern limits of Hackensack Meadows, a 12-unit machine. All of these yards are laid out on a new fill, built over the old freight and passenger main tracks. There will be humps with an elevation of 21 ft. and a 4 per cent grade. Direct current for the detector locking will be supplied by the Edison storage batteries, charged in series, discharged in multiple—duplicate motor generator sets being used for charging. The installation will be made by the railroad's own forces, with the materials to be supplied by the Union Switch & Signal Company.

THE BOSTON & MAINE has ordered from the Union Switch & Signal Company the materials for an electro-pneumatic interlocking at Tower "C," East Somerville, Mass.; a 71-lever frame with 66 working levers and a total of 147 operated units. The new plant will extend the electro-pneumatic system now in service, viz.: North Station (A), 123 working levers; and Tower B, 69 working levers, there being one block between Tower B and C. Speed signaling has been adopted for this interlocking and provision is also made to reverse traffic on the four main line tracks between Towers B and C. The plant also comprises a single-track crossing of the four tracks of the Boston & Maine by the Grand Junction line of the Boston & Albany. Alternating current track circuits will be used throughout, with electric section and section route locking. The electro-pneumatic high signals are semi-automatic, with push-button control of lower arms.

Supply Trade News

J. H. Sharp has been appointed western representative of the Glazier Manufacturing Company, with headquarters at the McCormick building, Chicago.

F. H. Bird, traveling engineer of the American Steel Foundries, Chicago, has received a commission as first lieutenant in the ordnance department of the United States army and is now stationed at Dayton, Ohio.

N. M. Stineman, until recently chief engineer of the LaSalle Engineering Company, Chicago, and formerly office engineer of the Chicago, Milwaukee & St. Paul, Chicago, has been commissioned a captain in the engineering corps of the United States army.

Oscar F. Ostby, 2736 Grand Central Terminal, New York, has been appointed sales representative for the White American Locomotive Sander Company, Roanoke, Va., for territory from Baltimore north to the Canadian border and west as far as Pittsburgh and Cleveland.

Effective January 1, Mr. J. E. Buckingham, at present Northwestern representative of the Standard Steel Works Company with offices in the Northwest Bank building, Portland, Oregon, will become assistant general manager of the Hofius Steel & Equipment Company, Seattle.

A Bacteriological Motor Car.—It is stated in the Indian and Eastern Engineer that a bacteriological car laboratory has been presented to the French Army. This remarkable motor car—the first of its kind—carries a complete bacteriological laboratory, 18 ft. by 12 ft., which can be erected in the space of an hour and a half. The laboratory is fitted with bacteriological incubators, microscopes and autoclave and all other accessories. These parts are fitted into specially designed canteens, so that nothing can be smashed, and everything is ready for use instantly and in the order required. The car and the portable laboratory are fitted with electricity and water is laid on.

Construction Work in Malay States.—The linking up of the Siamese Southern Railway with that of the British Federated Malay States has finally been accomplished, railway officers of both systems having recently traversed the new road connecting Bangkok with Singapore. However, the track on either side is not yet completed, a number of bridges and other masonry work remaining to be done, and owing to the difficulty of obtaining ironwork from abroad, the line may not be ready for passenger traffic until April of next year. The completion of the northern line has also been hindered because of delay in obtaining rails and other construction material. A proposal is therefore under consideration to complete the railway only as far as Pang Choompo, and from this place to build a road suitable for motor traffic to Chiengmai.—*Commerce Report.*

Automatic Signals Favored in Australia.—Automatic block signaling is approved on the New South Wales Government Railways, and is being introduced under two distinct conditions. On suburban lines it is used in order to shorten the headway between trains, and thus increase the traffic capacity. On country lines in districts that are thinly settled but have considerable through traffic it is found that automatic signals between stations afford improved facilities for dealing with through trains without requiring an increased force. The cost of installation and maintenance is greater than with manual signals, but there is a net saving in cost and an increase in safety due to the elimination of manual operation. Thus the 108 block sections equipped in 1916 would have required 46 signal towers, with a staff of 138 men whose wages would amount to not less than $120,000 per year. A cab-signal and train-control system is being tried experimentally on the Richmond Branch. An audible signal is given in the cab and must be acknowledged by the engineman. If he fails to stop within a given distance after receiving a "stop" signal, a partial application of the brakes is made automatically.—*Engineering News-Record.*

Railway Financial News

Baltimore & Ohio.—Negotiations are being conducted by this company for the purchase of the Little Kanawha Railroad, which extends from Parkersburg, W. Va., to Owensport, a distance of 29 miles.

Delaware & Hudson.—At a meeting of the directors on December 26, a quarterly dividend of 2¼ per cent was declared, an official announcement being issued as follows:

The practice of the Delaware & Hudson Company for recent years has differed from that of other railway corporations in that it has been customary to take final action upon the dividend for the ensuing calendar year during December.

For ten years the board of managers has in each December declared a dividend of 9 per cent, payable during the next year in four quarterly installments of 2¼ per cent, all such payments to be made out of surplus accumulative prior to the meeting at which the dividend action was taken.

The accumulative surplus of the present time as well as the earnings of the calendar year, 1917, now available for dividends, would fully warrant the declaration of a 9 per cent dividend payable in the same manner during 1918.

The board of managers feel that the present time is one of great uncertainty as to all the elements which will determine cash resources and cash requirements during the ensuing year. Under these conditions it is plain, without anticipating any future action, that it would be wise not to commit the company irrevocably to large cash disbursements, to be made so far in the future, but rather to follow the general practice of making dividend declaration quarterly.

Gulf, Mobile & Northern.—Negotiations have been completed by this company for purchase and control of the Meridian & Memphis Railway, which extends from Meridian, Miss., to Union, a distance of 33 miles. Formal transfer will take place as soon as the debts of the Meridian & Memphis are liquidated.

Little Kanawha.—See Baltimore & Ohio.

Marshall & East Texas.—Hearings on the petition of the St. Louis Trust Company tor court permission to sell this road as junk, have been postponed until January 14, 1918.

Meridian & Memphis.—See Gulf, Mobile & Northern.

Mohawk Railroad.—This company's line from Calumet, Mich., to Gay, which has been operated by the Mineral Range, was taken over by the Copper Range, effective December 15. Passenger service on the Copper Range between Houghton and Gay was established on December 17.

Pennsylvania Company.—This company, which operates the Pennsylvania Lines West of Pittsburgh, has declared a dividend of 3 per cent. The dividend is payable December 31 to stock of record December 25. All the stock is owned by the Pennsylvania Railroad. This makes 6 per cent declared this year, 3 per cent having been paid six months ago. In 1916, a total of 8 per cent was declared, and in 1915, 6 per cent.

Pennsylvania Railroad.—Comparing the number of this company's stockholders, on November 1, with a year ago, there was an increase of 7,174 to a total of 96,995. The average holdings were 102.95 shares, an increase of 8.22 per cent. The number of foreign holders was 1,857, a decrease of 1,633; and they held 2.13 per cent of the total 9,985,314 shares outstanding, a decrease of 1.58 per cent. The average holding abroad was 114 shares, an increase of 8.

In Pennsylvania there were 41,856 holders, an increase of 5,707, representing 33.81 per cent of the total stock outstanding; in New York, 17,723 holders, an increase of 858, representing 36.04 per cent of the total stock. Women stockholders numbered 48,327, or nearly half the stockholders, an increase of 3,791, and holding 28.49 per cent of the total share capital.

The Exports from Great Britain of railway cars for the first nine months of 1917 were valued at $1,606,003 as compared with $2,535,402 for the corresponnding period of 1916.

Railway Officers

Executive, Financial, Legal and Accounting

P. L. McManus has been appointed assistant to the president of the Coal & Coke Railway, with office at Elkins, W. Va.

V. J. Bradley, general supervisor of mail traffic of the Pennsylvania Railroad system, with office at Philadelphia, Pa., has been appointed vice-president's assistant in general charge of the mail traffic of the Pennsylvania Railroad, and the relations of the railroad with the government, in connection with the transportation of the United States mails.

C. M. Ball, whose appointment as assistant to the vice-president and general manager of the Oregon Short Line and assistant to the first vice-president of the Los Angeles & Salt Lake, with headquarters at Salt Lake City, Utah, was announced in these columns on December 14, was born at Osceola, Iowa. He entered the service of the Oregon Short Line in 1898 in a local freight office. In 1900 he resigned to engage in other business but returned to the road in 1902. In 1903 he was transferred to the superintendent's office as time keeper where he remained until 1905 when he resigned and entered the service of the Southern Pacific at Los Angeles, Cal., as chief clerk in the local freight office. In 1908 he was promoted to assistant chief clerk to the general superintendent where he remained until 1915 when he was again promoted to chief clerk to the assistant general manager which position he held until his appointment as mentioned above.

Operating

Maurice Daily has been appointed general superintendent of the Missouri, Oklahoma & Gulf, with headquarters at Muskogee, Okla., succeeding W. G. Humphrey.

E. C. Wills, superintendent of the Missouri Pacific at Wichita, Kan., has been appointed assistant general manager, with office at St. Louis, Mo., effective December 19.

A. S. Johnson, superintendent of the Terminal Railroad Association of St. Louis, who has been promoted to assistant general manager, a newly created position, with headquarters at St. Louis, Mo., as has already been announced in these columns, was born at Seymour, Ind., on July 21, 1871. He first entered railway service with the Terminal Railroad Association of St. Louis on November 8, 1889, and has been with that company ever since. He was appointed freight agent on October 13, 1903, and superintendent with headquarters at St. Louis on April 23, 1913. He was promoted to assistant general manager, with headquarters at St. Louis on December 13, 1917.

A. S. Johnson

J. H. Fraser, former general manager of the Detroit, Toledo & Ironton of Detroit, Mich., has been appointed general manager of the Gulf, Florida & Alabama, with headquarters at Pensacola, Fla.

F. M. Doar, superintendent of transportation of the Charleston & Western Carolina, with office at Augusta, Ga., has been appointed general superintendent, and the office of superintendent of transportation has been abolished.

G. L. Hickey, assistant to the vice-president and general manager of the Oregon Short Line, has been promoted to superintendent of transportation for the Union Pacific system, with headquarters at Omaha, Neb., succeeding E. C. Manson, resigned. Mr. Hickey was succeeded by C. M. Ball, as mentioned in these columns on December 14.

E. A. O'Donnell, assistant superintendent of the Southern Pacific Texas Lines, with office at El Paso, Tex., has been appointed superintendent Houston terminals, vice T. C. Worthington, resigned to accept service with another company.

W. H. Carter, trainmaster on the Cincinnati division of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Springfield, O., has been appointed assistant superintendent, with office at the same point; E. M. Kelly, trainmaster of the Sandusky division, with headquarters at Bellefontaine, O., has been transferred to the Cincinnati division, succeeding Mr. Carter; I. C. Schreck, trainmaster at Wabash, Ind., was appointed trainmaster of the Sandusky division, succeeding Mr. Kelly, and O. P. Whitlock was appointed assistant trainmaster of the Cincinnati division, succeeding H. E. Perry, who resigned to enlist in the army, effective December 1.

Edward Henry Harman, who has been appointed superintendent of the Wiggins Ferry Company, the St. Louis Transfer Railway and the East St. Louis Connecting Railway, with headquarters at St. Louis, Mo., as has already been announced in these columns, was born at Vernon, Ind., on August 25, 1876. He first entered railway service with the Vandalia in March, 1894. For two years he was employed in clerical capacities in the mechanical, operating and engineering departments at St. Louis, Mo., and Terre Haute, Ind., following which he was employed for two years in the mechanical department of the Terminal Railroad Association of St. Louis, at St. Louis. He then returned to the Vandalia at Terre Haute, where he was clerk and later chief clerk to the division freight agent. Two years later he went to Houston, Tex., to become private secretary to the chief engineer of the Southern Pacific Lines. He returned to the Terminal Railroad Association about 1901 and has been with that road ever since in the offices of the master mechanic, general superintendent and superintendent. For the past 10 years he has been chief clerk to the superintendent. Mr. Harman has been prominently identified with the American Association of Railroad Superintendents for a number of years, more recently as secretary, during which the membership increased from 75 to approximately 800. On his appointment as superintendent as noted above he resigned as secretary of that association.

E. H. Harman

Leonard T. Johnston, whose appointment as superintendent of the Prairie du Chien and Mineral Point divisions of the Chicago, Milwaukee & St. Paul with headquarters at Milwaukee, Wis., was announced in these columns November 23, was born at Dakota, Minn., on November 29, 1878. He entered the service of the Chicago, Milwaukee & St. Paul on October 31, 1894, and has been in the employ of that company continuously from that date, serving as telegraph operator until July, 1899, when he was promoted to train despatcher. On March 20, 1907, he was again promoted to chief despatcher, which position he held until August 26, 1912, on which date he was promoted to train master. He remained in that capacity until November 5, 1917, on which date his appointment as mentioned above became effective.

W. M. Weidenhamer, whose appointment as inspector of transportation of the Chicago, Milwaukee & St. Paul was announced in these columns December 14, was born in Schuyler county, Ill., on June 23, 1863. He entered the service of the Chicago, Burlington & Quincy on January 2, 1880, as a brakeman and was promoted to conductor on February 12, 1885. On May 4, 1904, he

was assigned to special duties by the operating vice-president. He was appointed trainmaster of the Galesburg division, with headquarters at Galesburg, Ill., on November 1, 1904, and on October 15, 1905, he was transferred in the same capacity to the McCook division with headquarters at McCook, Neb. He was promoted to superintendent of the Sterling division on December 15, 1908, with headquarters at Sterling, Colo., and on December 1, 1909, was transferred in the same capacity to the Alliance division with headquarters at Alliance, Neb., which position he held until December 1, when he resigned to accept service with the St. Paul, as noted above.

M. B. Lamb, whose appointment as superintendent of the Chicago, Burlington & Quincy at Hannibal, Mo., was announced in these columns on December 7, was born in Hannibal on November 12, 1872. He entered the service of the Burlington on September 1, 1886, as a caller at Burlington, Ia. From October 1, 1889, to March 1, 1894, he was telegraph operator on the Ottumwa division; from March 1, 1894, to May 1, 1895, telegraph operator at Hannibal, Mo.; from May 1, 1895, to December 30, 1899, telegraph operator, bill clerk and chief clerk, freight department, Keokuk, Iowa; from December 30, 1899, to May 12, 1903, wire chief, car distributor and despatcher at Hannibal, Mo.; May 12, 1903, to February 15, 1907, despatcher at Brookfield, Mo.; from February 15, 1907, to January 1, 1911, night chief despatcher at Brookfield, Mo.; from January 1, 1911, to June 12, 1912, terminal trainmaster at Beardstown, Ill.; and from January 12, 1912, to June 20, 1917, trainmaster of the Beardstown division. On June 20, 1917, he was promoted to assistant superintendent of the La Crosse division, with headquarters at St. Paul, Minn., which position he held at the time of his appointment as superintendent of the Hannibal division, effective December 1.

Traffic

G. A. Blair, assistant freight traffic manager of the Chicago, Milwaukee & St. Paul at Chicago, has resigned, effective December 31.

C. H. Guion has been appointed commercial agent of the Missouri, Kansas & Texas of Texas, at Galveston, Tex., succeeding C. P. Norman, acting commercial agent, transferred, effective December 1.

Engineering and Rolling Stock

J. A. Heaman, whose appointment as assistant chief engineer of the Grand Trunk Pacific, with headquarters at Winnipeg, Man., was announced in these columns on November 16, was born at Memphis, Tenn., on June 3, 1874. He attended the public schools and Collegiate Institute at London, Ont., and graduated from McGill University at Montreal, Que., in 1902. He was also an articled pupil to Moore & Henry, engineers and surveyors at London, Ont., from 1893 to 1898 and holds a diploma for the Ontario and Dominion Land Surveyors. He entered railway service as an instrument man on the Grand Trunk at St. Catherines and Port Union, Ont., in April, 1901. He was resident engineer at Oshawa, Ont., from April, 1902, to November, 1902; from November, 1902, to November, 1903, he was assistant resident engineer at Toronto, Ont. He entered the service of the Grand Trunk Pacific as an assistant engineer in charge of a location party east of Winnipeg in November, 1903. From May, 1905, to November, 1906, he was division engineer in charge of location and construction east of Winnipeg, and from November, 1906, to October, 1908, he was assistant district engineer at Kenora, Ont. From October, 1908, to June, 1910, he was assistant district engineer of the Grand Trunk Pacific at Kenora and Winnipeg, and in April, 1911, was promoted to district engineer with office at Winnipeg, in which position he remained until March, 1912, when he was appointed office engineer at Winnipeg. From March, 1912, until August, he was division engineer at Jasper, Alta. On the latter date he was promoted to assistant to the chief engineer at Winnipeg, which position he held at the time of his appointment as mentioned above, effective November 1.

J. A. Heaman

Edward S. Pearce, whose appointment as mechanical engineer of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Beech Grove, Ind., was announced in the issue of December 7, graduated from the mechanical engineering course at Purdue University and was first employed in the maintenance of way and mechanical departments of the Norfolk & Western. From June, 1913, to January, 1914, he was employed in the machinery department of Jos. T. Ryerson & Sons, Chicago. On the latter date he entered the service of the New York Central Lines West as a special engineer in the office of the chief mechanical engineer at Chicago, where he remained until June, 1914, when he was transferred in the same capacity to the office of the superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis. In April, 1916, he was promoted to assistant mechanical engineer and in January, 1917, he was again promoted to special engineer in the office of the general superintendent, transportation department which position he held at the time of his appointment, as noted above, effective December 1.

H. R. Warnock, whose appointment as general superintendent of motive power of the Chicago, Milwaukee & St. Paul, was mentioned in these columns December 14, was born at Newcastle, Pa., on July 16, 1870. He began railway work as a freight brakeman with the Pennsylvania Lines West of Pittsburgh in June, 1889, and later in the same year went to the Pittsburgh & Lake Erie as a brakeman. In September, 1891, he was promoted to locomotive fireman and later was locomotive engineer, which position he held until May, 1900. From that date until July, 1904, he served consecutively as engine despatcher, roundhouse foreman, and general foreman, resigning on the latter date to become master mechanic of the West Side Belt, Pittsburgh, Pa., where he remained until October, 1905, when he became master mechanic of the Monongahela Railroad. He remained in this position until September, 1913, when he was appointed superintendent of motive power of the Western Maryland, which position he held until his appointment as noted above, effective December 15. As general superintendent of motive power of the St. Paul, he will have headquarters at Chicago.

H. R. Warnock

Railway Officers in Military Service

F. G. Robbins, general superintendent of the Erie at Chicago, has been commissioned a major in the Engineers Officers' Reserve Corps.

J. R. Jackson, assistant engineer of tests of the Atchison, Topeka & Santa Fe, Chicago, has received a commission as captain in the ordnance department of the United States army.

C. W. Haupt, assistant engineer in the valuation department of the Illinois Central, Chicago, has received a commission as second lieutenant in the engineering corps of the United States army.

South African Traffic Restricted.—A cable to the African World states that in consequence of a shortage of locomotive power on the South African railways, coupled with the movement of maize coastwards, the coal and passenger traffic is restricted.

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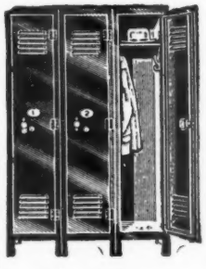

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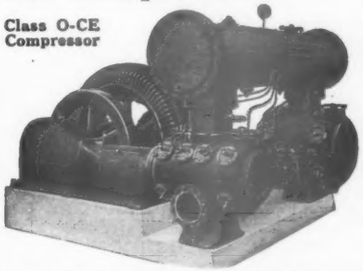

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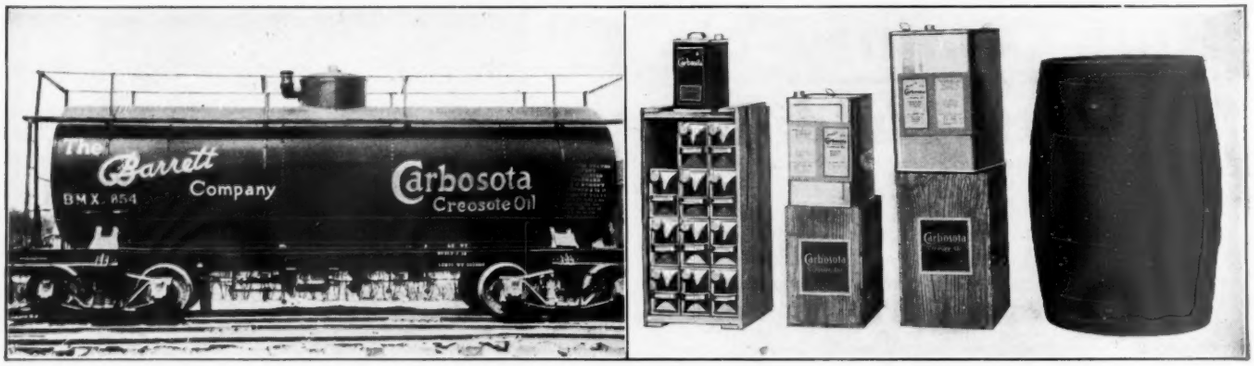

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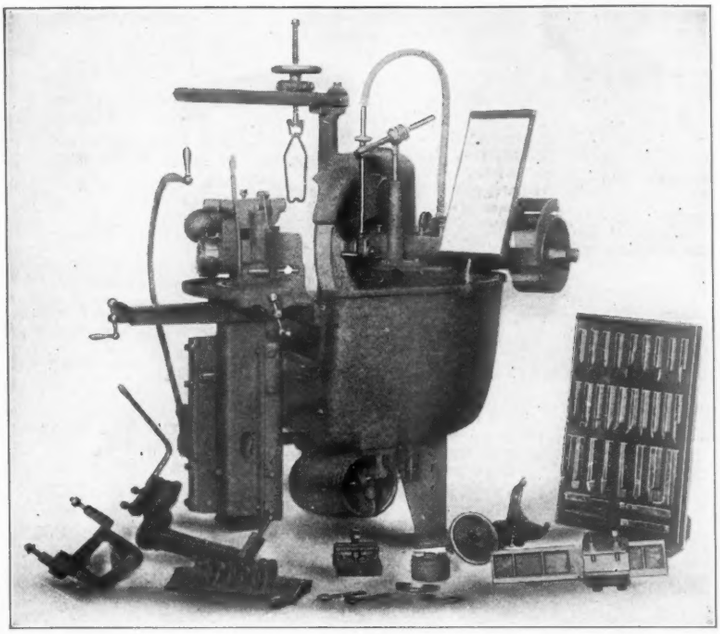

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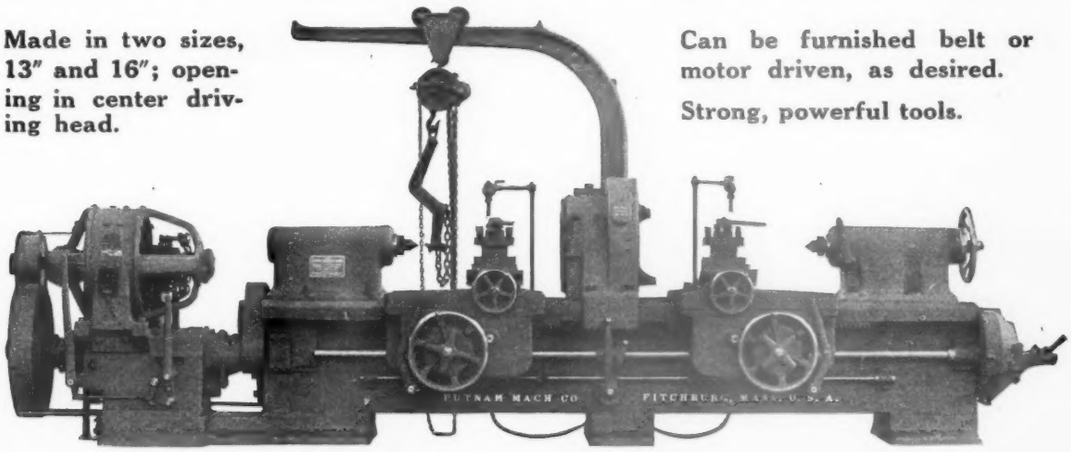

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Rome Iron Mills, Inc.

STAYBOLT SLEEVES.
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STEAM HAMMERS—(SEE HAMMERS, POWER).

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Osgood Co., The

STEAM TRAPS.
Crane Co.
National Tube Co.

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STEEL, TOOL.
Midvale Steel & Ordnance Co.

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Hall Switch & Signal Co.
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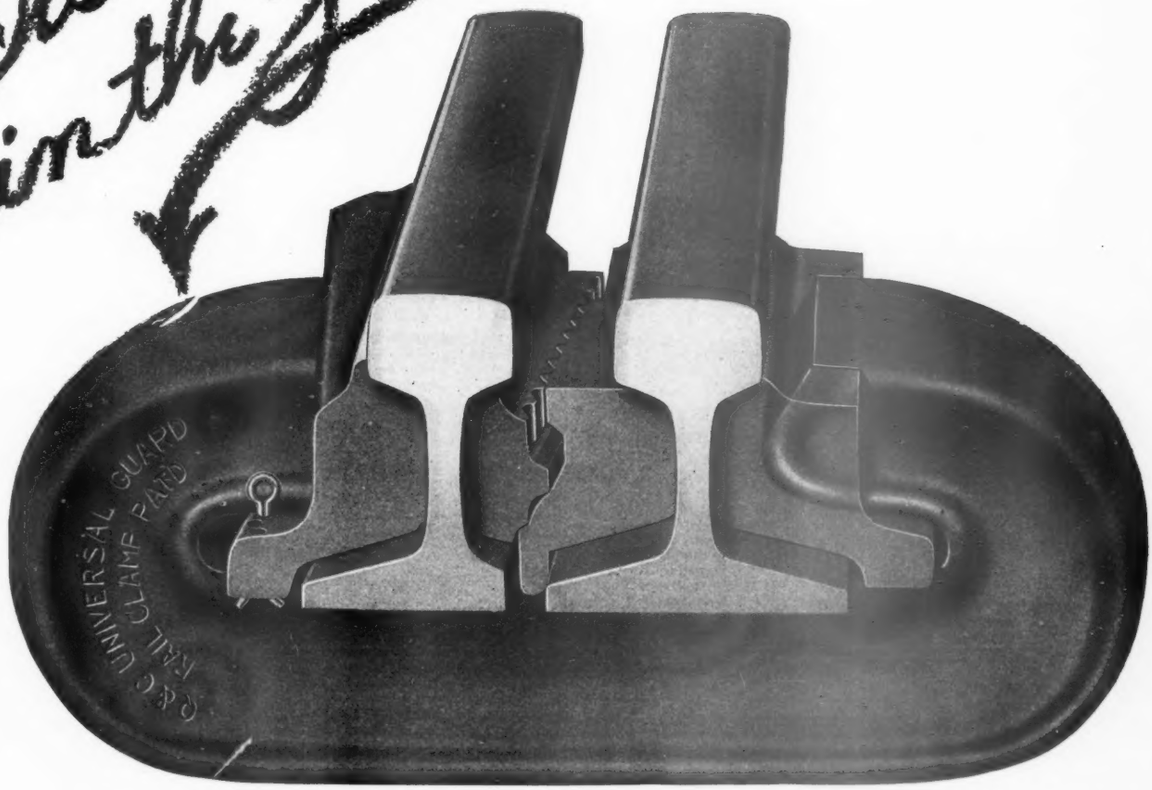
Ramapo Iron Works
Union Switch & Signal Co.

It's all in the Yoke



SEE THAT BIG YOKE with its generous proportions! Not skimpy or weak looking. Its husky and strong appearance gives you an immediate impression that it is built to withstand the sudden thrusts, strains and pounding of heavy traffic. And it does! The yoke is ***drop forged, heat treated*** steel of the "I" beam type; a construction that is generally admitted to be many times stronger than cast metal.

Besides this one big feature, the Q & C Universal Guard Rail Clamp has other points of merit, such as

—the yoke is interchangeable for all standard "T" sections of rail.

—the shelf on the wedge and the wide bearing surface of the shoe maintain the vertical alignment of the yoke.

—it can be easily and quickly applied without moving the guard rail.

—it does not interfere with detector bars.

—wedge, adjustable filler blocks and shoe are accurately fitted to rail section.

The two types—"Universal No. 2" and "Q & C Special"
—meet every railway traffic condition.

Write for prices and complete details.

The Q AND C

The Q AND C Co.
New York: 90 West Street
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Universal Type Guard Rail Clamp

THE Q AND C STANDARD RAILWAY DEVICES

DIRECTORY OF ADVERTISERS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5

TAMPING MACHINES, TIE—(SEE TIE TAMPING MACHINES).

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American Locomotive Co.
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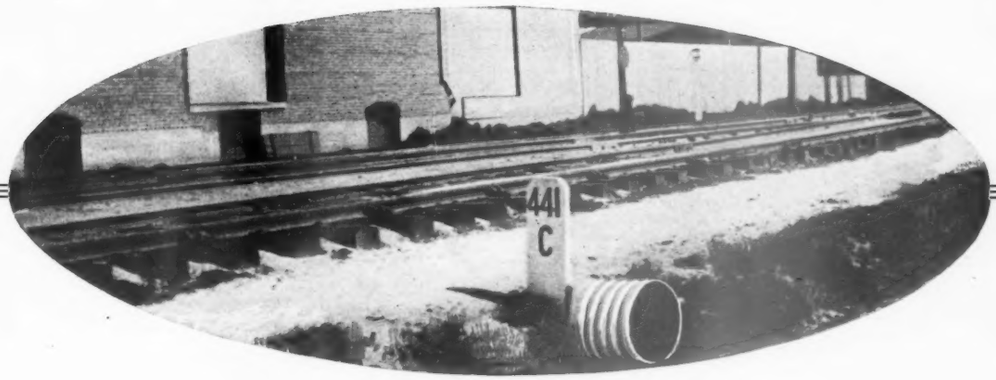

MAIN LINE SOUTHERN PACIFIC 24" "ARMCO" IRON CULVERT WAS INSTALLED IN 1913

Against Time and Traffic

Consider what it means to withstand the hammering of the heaviest kind of motive power; consider what it means for a culvert to withstand the insidious attacks of frost and heat, snow and rain and the chemical action of smoke-laden atmosphere. That's why we say

"ARMCO" IRON CULVERTS

are an insurance against time and traffic. It is true, that you want strength—you have it in "Armco" Iron Corrugated Culverts. You also want ease and quickness of installation and adaptability to rough-and-ready conditions; above all, you want long service. Again you have it in "Armco" Iron Corrugated Culverts; for the qualities Purity—Evenness—Solidity are characteristics that make for service—a lifetime of service; and these are the notable characteristics of "Armco" Iron.

Write the Nearest Manufacturer for full information as to Rust-Resisting "Armco" (American Ingot) Iron Culverts, Flumes, Siphons, Sheets, Roofing and Formed Products.

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Dixie Culvert & Metal Co.
California, Los Angeles
California Cor. Culvert Co.
California, West Berkeley
California Cor. Culvert Co.
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Delaware, Clayton
Delaware Metal Culvert Co.
Florida, Jacksonville
Dixie Culvert & Metal Co.
Georgia, Atlanta
Dixie Culvert & Metal Co.
Illinois, Springfield
Illinois Corrugated Metal Co.
Indiana, Crawfordsville
W. Q. O'Neall Co.
Iowa, Des Moines
Iowa Pure Iron Culvert Co.
Iowa, Independence
Independence Culvert Co.
Kansas, Topeka
The Road Sup. & Metal Co.
Kentucky, Louisville
The Kentucky Culv. Mfg. Co.
Louisiana, New Orleans
Dixie Culvert & Metal Co.
Maryland, Baltimore
Wm. M. Baker, Munsey Bldg.
Massachusetts, Palmer
New England Metal Cul. Co.
Michigan, Bark River
Bark River Bridge & Cul. Co.
Michigan, Lansing
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Oklahoma, Shawnee
Dixie Culvert & Metal Co.
Oregon, Portland
Coast Culvert & Flume Co.
Pennsylvania, Warren
Pennsylvania Metal Cul. Co.
South Dakota, Sioux Falls
Sioux Falls Metal Culvert Co.
Tennessee, Nashville
Tennessee Metal Culvert Co.
Texas, Dallas
Wyatt Metal & Boiler Works.
Texas, El Paso
Western Metal Mfg. Co.
Texas, Houston
Lone Star Culvert Co.
Utah, Woods Cross
Utah Corrugated Culvert & Flume Co.
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AMERICAN ARMCO INGOT IRON
Resists Rust

AMERICAN ARMCO INGOT IRON
Resists Rust

2

12" "ARMCO" IRON CULVERT. INSTALLED 1907. CONDITION PERFECT. MAIN LINE SOUTHERN PACIFIC (SHASTA ROUTE).

In 55 calendar days, this building, 600 feet x 900 feet, 540,000 sq. ft., was ready for the owner.

Austin Standard Factory-Buildings

120,000 Square Feet in 30 Working-Days
540,000 Square Feet in 55 Calendar Days

NINE Austin Standard No. 3 Factory-Buildings, each 600 feet long, were here placed side by side to make a structure 600 by 900 feet —540,000 square feet of well lighted, clear-working floor space. In 30 working-days from date of order the owner occupied 120,000 square feet. In 55 *calendar* days, less than half the schedule time, the owner occupied the entire 540,000 square feet.

To railway men, in this time of national crisis, permanent, well built industrial buildings, erected complete in 30 or 60 working days, mean a service of unusual value.

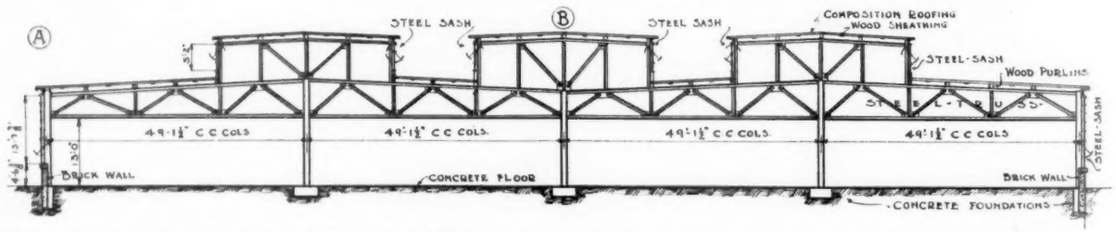
Austin Standard Factory-Buildings in nine types are ready to meet your needs for short-time delivery of completed floor space. Designs are ready. Structural materials are under order and in stock ready for shipment to your site.

In special work as well as standard, unit responsibility as applied to industrial building means much to the Owner in sureness of results. An Austin contract insures quality, definite cost, and completion on time.

Write, phone or wire the office nearest the proposed work.

The Austin Company
INDUSTRIAL BUILDERS

Cleveland	16210 Euclid Avenue	Eddy 4500
Detroit	Penobscot Building	Cherry 3894
Indianapolis	Merchants' Bank Building	Main 6428
New York	217 Broadway	Barclay 8886
Pittsburgh	House Building	Court 1993
Philadelphia	Bulletin Building	{ Spruce 1291 / { Race 4017
Washington	Bellvue Hotel	Main 2550



This section shows how Austin Standard No. 3 Building can be extended laterally to any required width. From the point *A* to point *B*, leaving out the monitor under *B*, is the original Standard Cross Section. In the building shown above, the width was 900 feet.

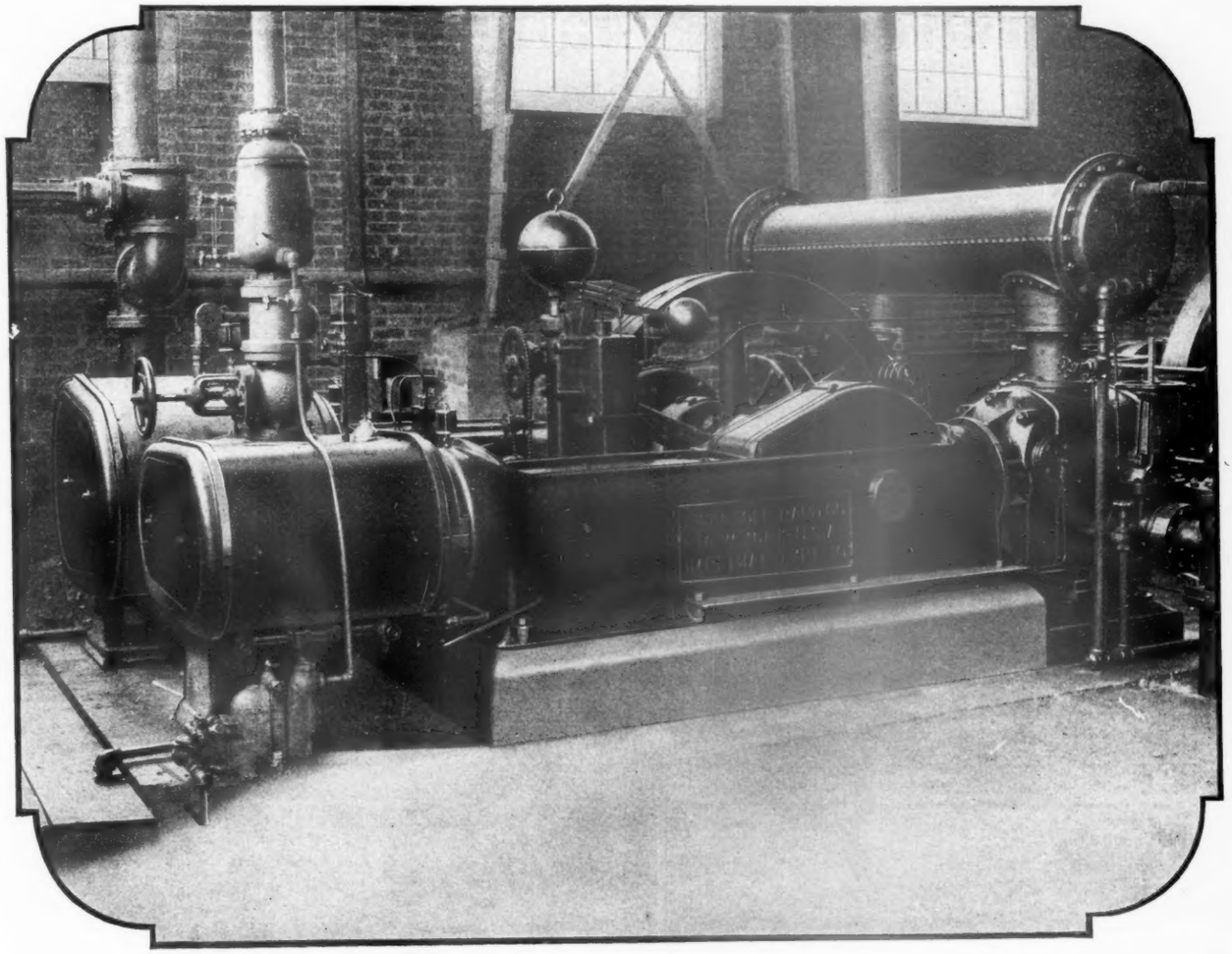
INGERSOLL-RAND AIR COMPRESSORS

Ingersoll-Rand Company is undoubtedly the oldest as well as the largest builder of Air Compressors in the world.

It is safe to say, that in nearly every instance, it has pioneered in the adoption of features that meant added economy and efficiency of operation.

Nor was the Company ever content to stop with improved performance. Manufacturing methods, workmanship and materials have been continually improved until the most discriminating buyers have come to standardize on Ingersoll-Rand Compressors, **eliminating entirely the risk of buying.**

Among the more than twenty styles and over one thousand sizes, there is some one machine which will meet your individual requirements like no other builder can. **It will place you on the "Satisfied List."**



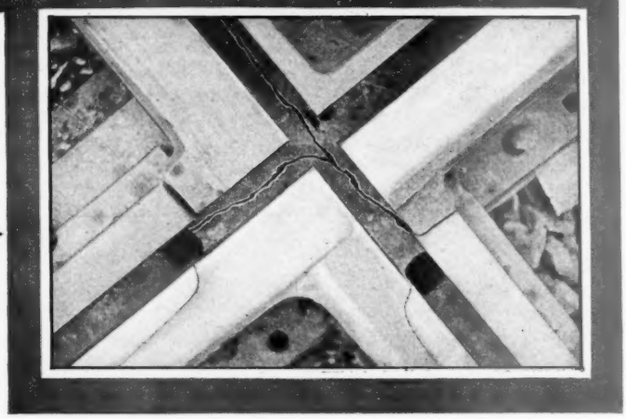
"Imperial" Type XPV Compressor has balanced piston steam valves, automatic cut off control, automatic flood and force feed lubrication and the standard Imperial air end. Bulletin 3033.

INGERSOLL-RAND COMPANY

11 Broadway, NEW YORK **Offices the World Over** **165 Q. Victoria St., LONDON**

BAROMETRIC CONDENSERS **TIE TAMPING OUTFITS** **PNEUMATIC TOOLS**

There's the Trouble



—But

It's Overcome in the Balkwill Articulated Cast Manganese Crossing

THE reversal of stresses caused by passing wheels cannot be resisted by a cast manganese crossing having the flangeway intersections or corners cast solid. The effect on this type of crossing is pictured above. Cracks at flangeway intersections make it necessary to replace such crossings before they are worn out.

The idea has been conceived of making a cast manganese crossing in units, scientifically designed joints being placed where these cracks formerly occurred. The Balkwill Articulated Cast Manganese Crossing is founded on this idea and has proved to correct the difficulty.

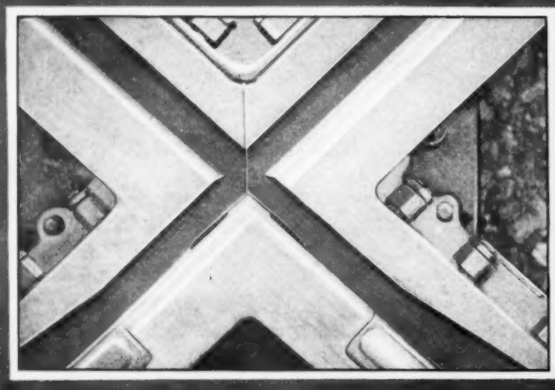
By placing these joints at the points of greatest stress, the units of the crossing are permitted to weave an inconsiderable amount, being always held in proper relation to each other, yet avoiding the strains which break the solid cast manganese crossing.

The Balkwill crossing consists of four side pieces, each of which forms a tread, flangeway and guard rail, and four corner pieces which form the tread portions of the exterior arms.

More than thirteen roads have installed BALKWILL ARTICULATED CAST MANGANESE CROSSINGS, and their repeat orders speak for the service they are giving under severest traffic conditions.

Request your crossing maker to furnish Balkwill Articulated Cast Manganese Crossings and refuse to accept a substitute, as he cannot furnish you anything else that ***"is just as good."*** *If he has not taken out a license to manufacture these crossings,* ***write us direct.***

BALKWILL



Here It's Corrected

The Balkwill Manganese Crossing Co., 506 Williamson Bldg. Cleveland, Ohio

Standing Between Man Failure and Disaster

A REPORT of the New York Public Service Commission, on railway accidents, contains commendation for the signal and the maintenance of way departments, and points out the greatest existing source of accidents. It says, "* * * The absence of serious accidents is clearly attributable to the use of automatic signals with track circuits, and to the vigilance of maintenance of way employees. * * * While many of the accidents are the result of failures on the part of equipment, there are too many resulting from man failures."

This means that the present greatest safety need is something to stand between man failures and disaster.

There is always danger that the engineer may not see and interpret every signal with unfailing accuracy. Should he fail to act on the signal indication, the Miller Train Control acts for him.

The normal position of the control is at stop, and the train approaches each block with the control ready to automatically apply the brakes and stop the train, as the engineer would do. A clear signal is indicated audibly in the cab by an electro-pneumatic whistle operated by current taken from the control ramp. It is impossible for the ramp to be electrically energized except when the signal indicates clear.

The Miller Train Control does all that an automatic stop should do, and is absolutely dependable.

Miller Train Control

Staunton, Va. **Danville, Ill.**

C., B. & Q. Betterment Work with Western 20 Yd. Air Dump Cars

They Do Not Interfere With Traffic

In Filling and other Betterment work use Western Air Dump Cars. M. C. B. construction. Can run in safety on passenger train schedule.

"I size up a contractor," said a railroad engineer, "by the number of Western cars he owns."

Construction and maintenance departments of Railroads are not properly efficient without Western Air Dump Cars.

Western Wheeled Scraper Company
Earth and Stone Moving Machinery
Aurora, Illinois

WHITING
AIR HOISTS

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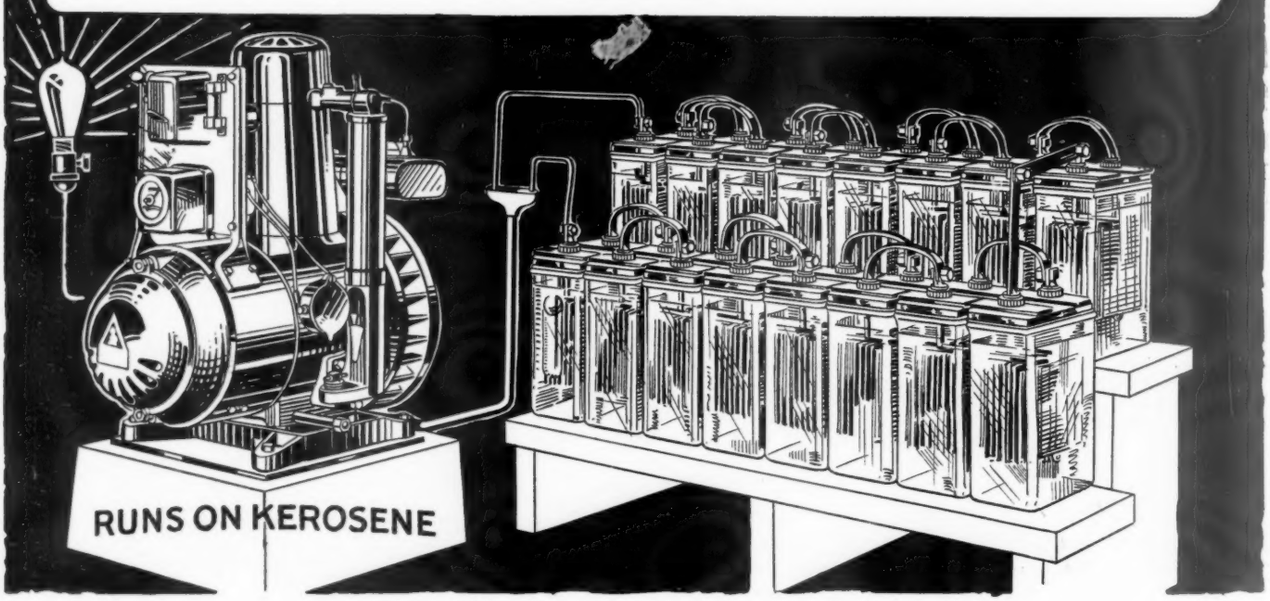

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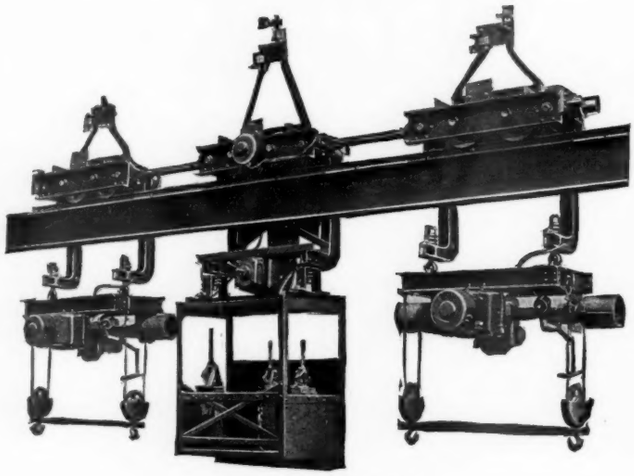

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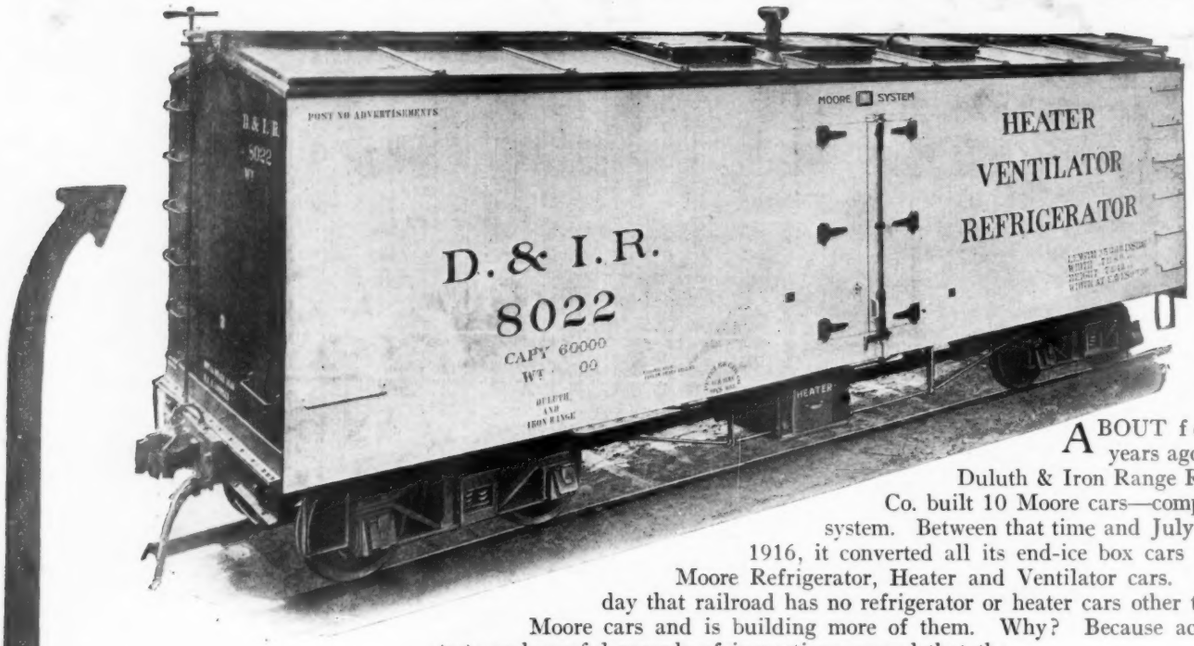

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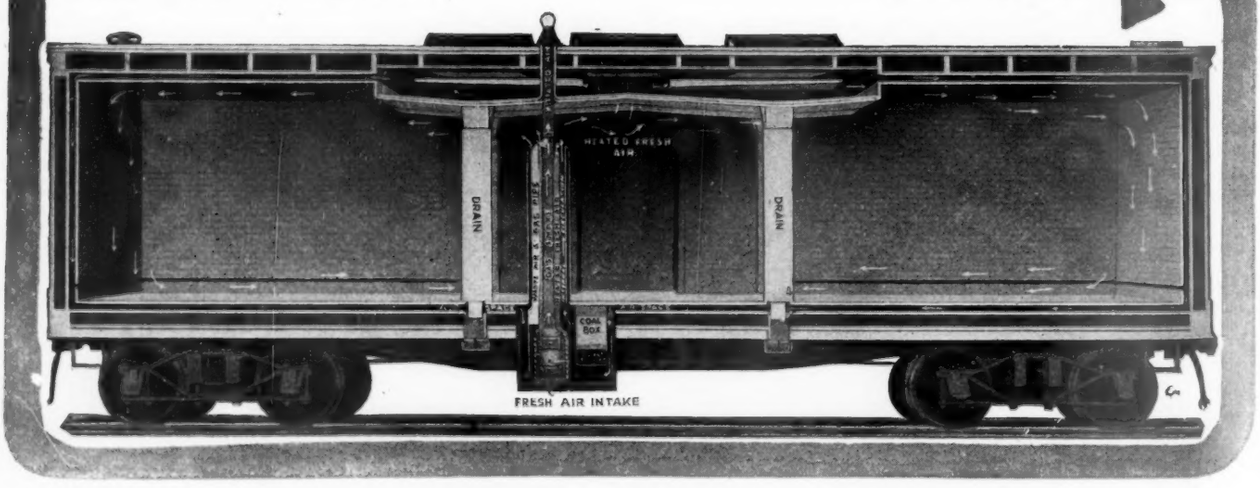
Detail reasons for all these and other savings and advantages of Moore System in our booklets, as well as letters of actual users which show why it affords the *Economical Scientific Solution of that Perishable Freight Problem* of Yours. Send today for this convincing testimony.

REFRIGERATOR, HEATER & VENTILATOR CAR CO.

924 Merchants Bank Building **Saint Paul, Minn.**



Every Part of the Truck Painted with Speed, Uniformity and Economy

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Aeron Finishing System (Surpasses Brushing) Portable Painting Equipment

The Aeron System has brought to railway equipment painting the same notable advantages and economies enforced by it in so large a number of industrial finishing rooms.

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The Aeron System paints Car Bodies, Stencils, Locomotives, Bridges, Building Exteriors and Interiors with the same high degree of speed, uniformity and economy. It entirely eliminates the inefficiency and costliness of hand-brushing.

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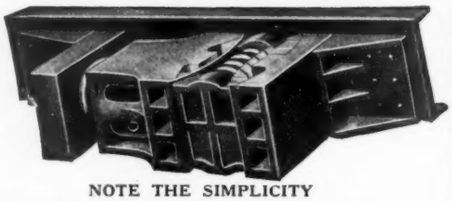

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FEW PARTS.—Large Wearing Surfaces, 6½ or 9⅛ Yoke, or Combined with any Side Link Attachment.
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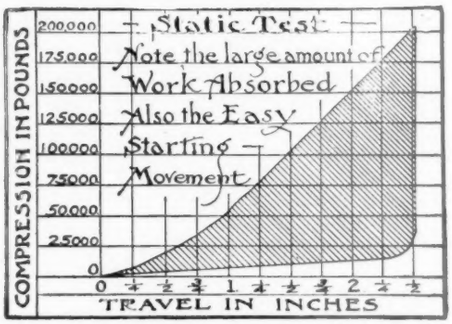

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The Strongest Carline made. It meets every demand of a Perfect Roof Support.

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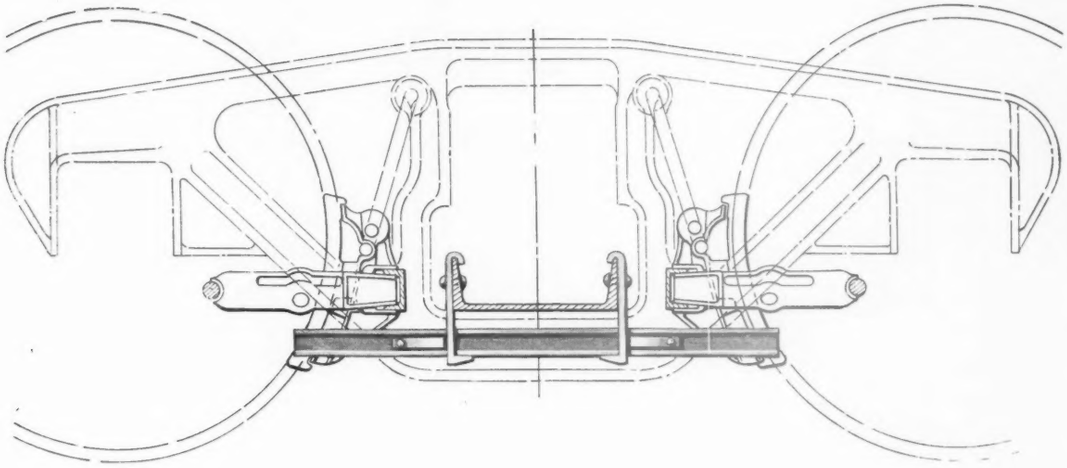

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The supporting bar at each end of the spring plank keeps them up.

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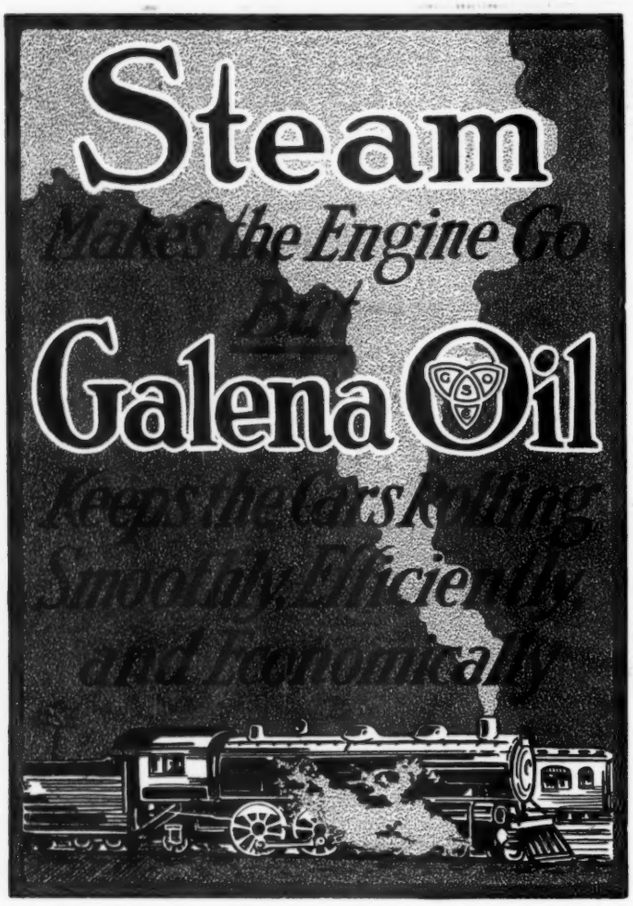

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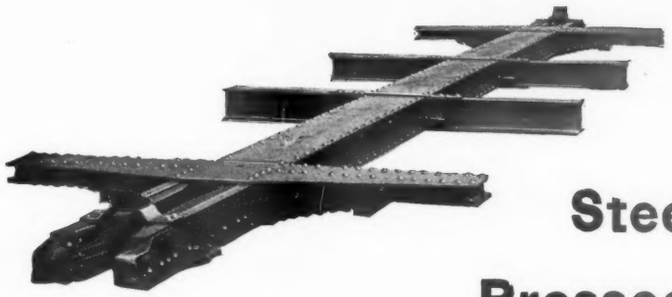

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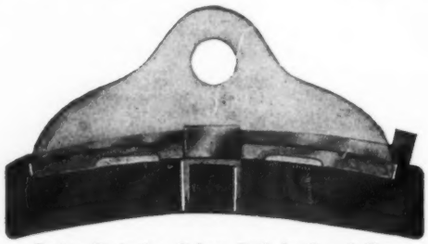

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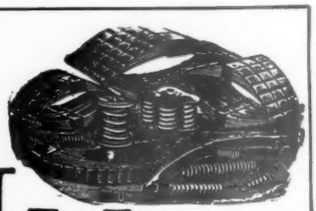
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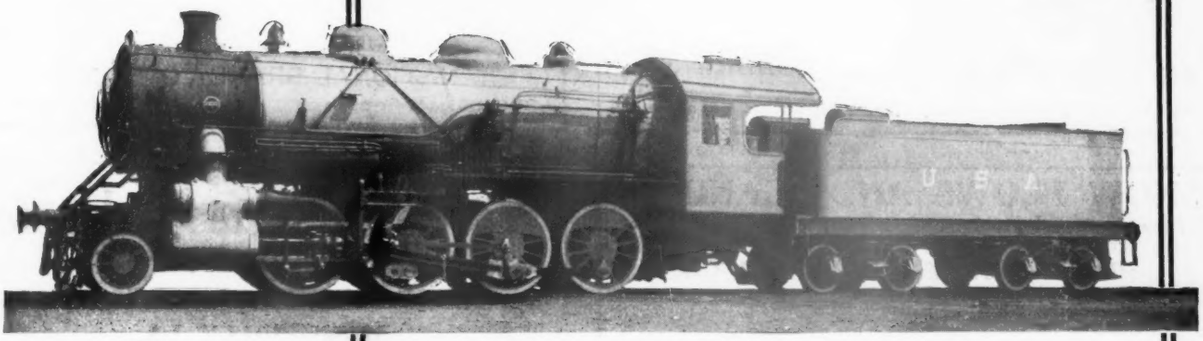

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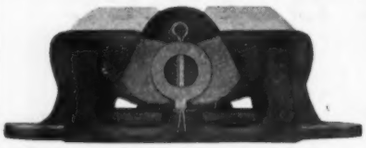

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MULE-HIDE Waterproof Canvas for roofs of Passenger Coaches, Cabooses and Cabs.
PER-BONA Insulating Paper for Refrigerator Cars.
MULE-HIDE Fabric, membrane for Waterproofing Concrete Construction.
MULE-HIDE Roofing for Railroad Buildings, etc.

THE LEHON COMPANY, W. 45th Street and Oakley Ave. CHICAGO

BOWSER ESTABLISHED 1885

OIL AND GASOLINE STORAGE SYSTEMS

THEY MEAN SAFETY AND ECONOMY WRITE FOR BULLETIN

S. F. BOWSER & CO. INC Fort Wayne, Ind.

MASON SAFETY TREADS—prevent slipping and thus obviate damage suits.
KARBOLITH CAR FLOORING—for steel cars is sanitary, fireproof and light in weight.
STANWOOD STEPS—are non-slipping and self-cleaning.
Above products are used on all leading Railroads. For details address

AMERICAN MASON SAFETY TREAD CO.

Main Offices: Lowell, Mass. Branch Offices: Boston, New York City, Philadelphia, Chicago, Washington, Kansas City, Cleveland, St. Louis.

"WAYCOTT"—"DAMASCUS"—"ANGLROD"

BRAKE BEAMS

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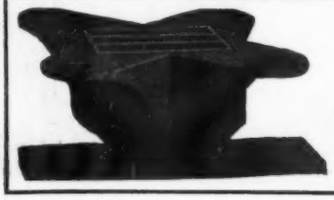
MALLEABLE CASTINGS

ANNUAL CAPACITY, 25,000 TONS

FORT PITT MALLEABLE IRON CO., Pittsburgh, Pa.



Roller Center and Side Bearings

EDWIN S. WOODS & CO.

McCormick Bldg., Chicago
50 Church Street, New York

PULVERIZED COAL EQUIPMENT

Send for Catalogue No. 71 describing Pulverizer Mills, Crushers, Dryers, and Pulverized Coal Feeders.

LEHIGH CAR, WHEEL & AXLE WORKS

Main Office and Works: Catasauqua, Pa.

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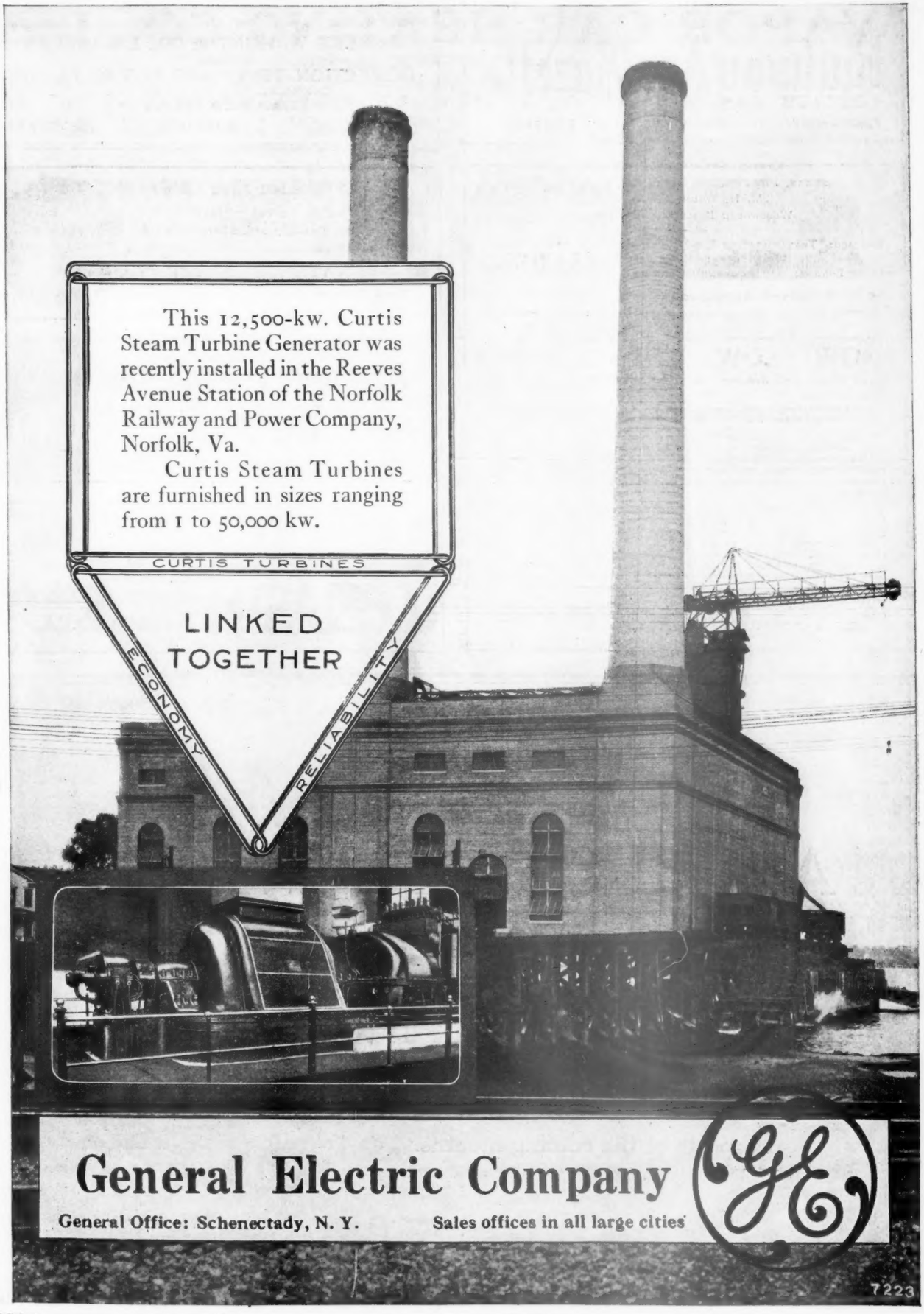
This 12,500-kw. Curtis Steam Turbine Generator was recently installed in the Reeves Avenue Station of the Norfolk Railway and Power Company, Norfolk, Va.
Curtis Steam Turbines are furnished in sizes ranging from 1 to 50,000 kw.
CURTIS TURBINES
LINKED TOGETHER
ECONOMY
RELIABILITY
General Electric Company
General Office: Schenectady, N. Y.
Sales offices in all large cities
7223

Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY

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L. B. SHERMAN, *Vice-Pres.* HENRY LEE, *Vice-Pres. & Treas.*
M. H. WIUM, *Secretary.*
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WE GUARANTEE, that of this issue 9,606 copies were printed: that of these 9,606 copies 7,640 were mailed to regular paid subscribes, 169 were provided for counter and news companies' sales, 815 were mailed to advertisers, 867 were mailed to exchanges and correspondents, and 115 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 471,183, an average of 9,061 copies a week.

THE RAILWAY AGE GAZETTE is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

Robert W. Hunt Jno. J. Cone Jas. C. Hallsted D. W. McNaughar
ROBERT W. HUNT & CO., ENGINEERS
BUREAU OF
INSPECTION TESTS AND CONSULTATION
CHEMICAL AND PHYSICAL TESTS
ESTABLISHED OFFICES IN
CHICAGO NEW YORK PITTSBURGH ST. LOUIS SAN FRANCISCO
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Ashton High Grade
Pop Valves—Steam Gages
the quality standard for over 40 years
Exclusive features insuring greatest efficiency and durability.
THE ASHTON VALVE CO.
Boston and Chicago

RAILWAY VARNISHES
ENAMELS
COLORS
The KAY & ESS CO.
DAYTON, OHIO

CARBURET
DURELASTIC
WADSWORTH-HOWLAND CO.
Railway Wearing Blacks
CHICAGO, ILL.

Annual Statistical Number

The Annual Statistical Number of the Railway Age Gazette will be published next week, January 4, 1918.

In addition to the usual statistical features, it will contain several articles summing up the unusual happenings of the year and commenting on the present situation and the prospects of the coming months.

MODERNIZE

"*Speed of production* and the mobilization of all our national power are essential to victory and mean the saving of human life, an earlier ending of the designs of autocracy and militarism and the return to the peoples of the earth of peace and happiness."

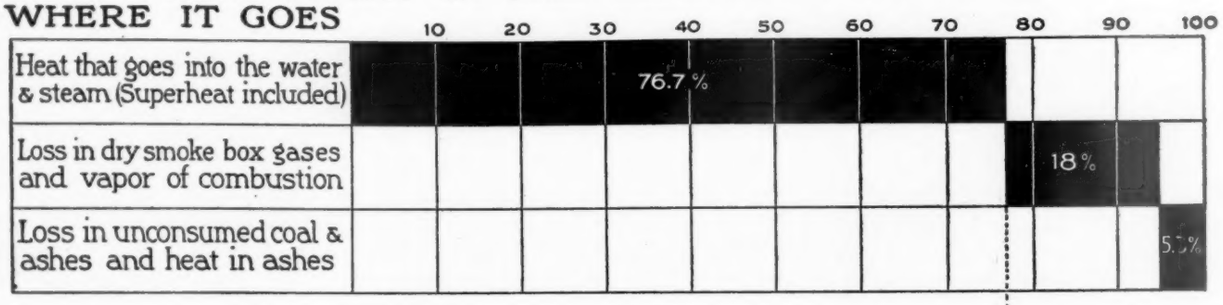
Chamber of Commerce
of the
United States of America

Modernizing old engines increases the capacity of the railroad and *speeds up production.*

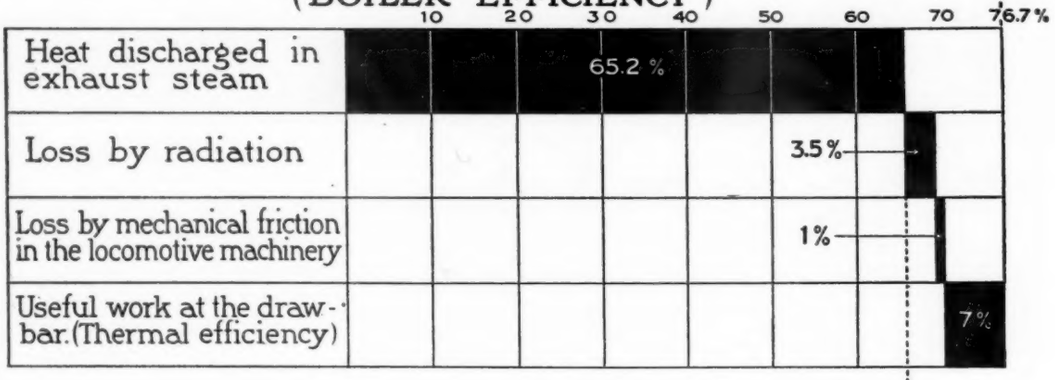
G. M. BASFORD CO.

TOTAL HEAT IN THE COAL 100 PER CENT

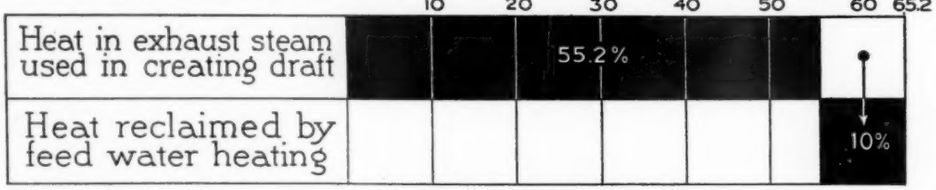
WHERE IT GOES


10 20 30 40 50 60 70 80 90 100
Heat that goes into the water & steam (Superheat included)
76.7 %
Loss in dry smoke box gases and vapor of combustion
18 %
Loss in unconsumed coal & ashes and heat in ashes
5.3%

TOTAL HEAT TRANSFERRED FROM COAL INTO STEAM (BOILER EFFICIENCY)

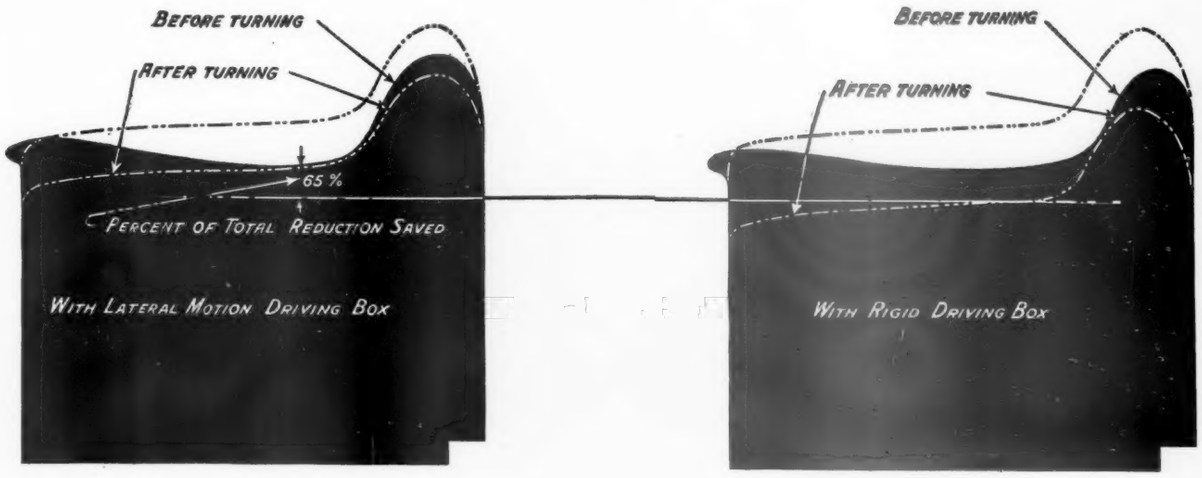

10 20 30 40 50 60 70 76.7%
Heat discharged in exhaust steam
65.2 %
Loss by radiation
3.5%
Loss by mechanical friction in the locomotive machinery
1%
Useful work at the draw-bar. (Thermal efficiency)
7%

HEAT RECLAIMED BY FEED WATER HEATING



Locomotive Feed Water Heater Co.

30 Church Street New York



FRONT TIRE ON A MIKADO LOCOMOTIVE

RESULTS

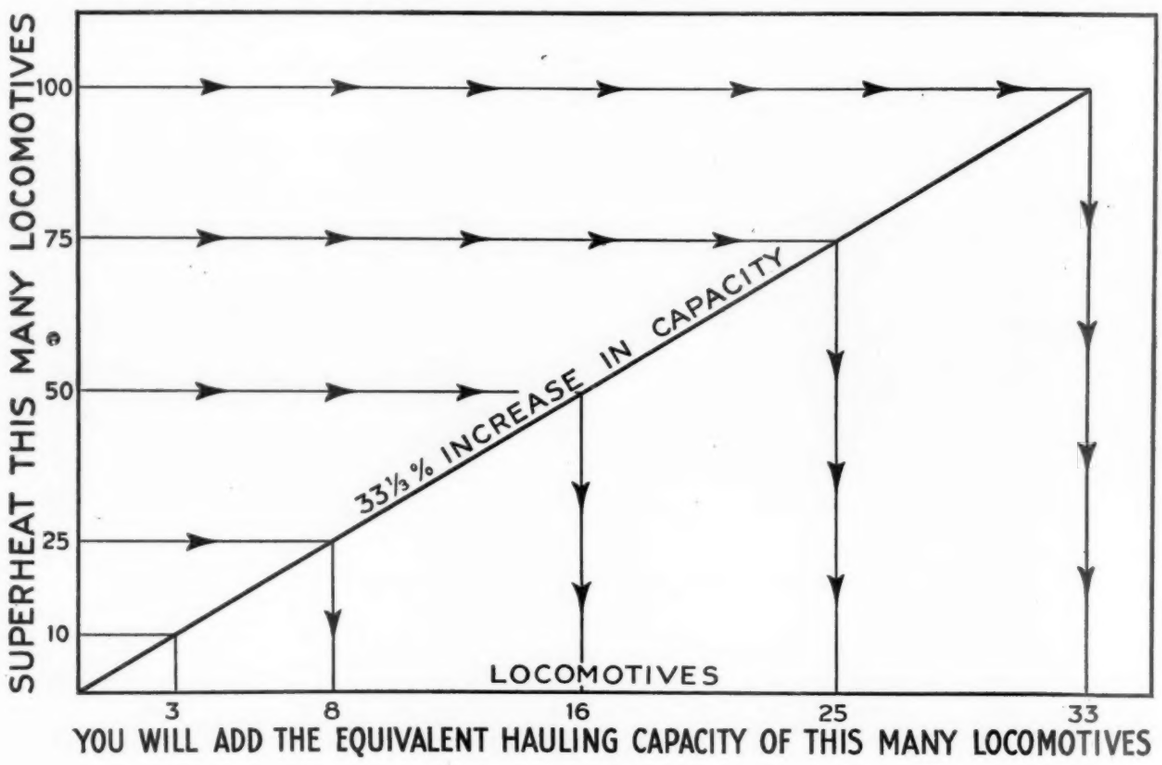
Lateral Motion Driving Boxes saved 65% of the total service metal reduction on the front tires of a Mikado.

On long wheel base engines they relieve the irresistible flange pressure on curves.

Lateral motion driving boxes were designed for the big 2-10-2 type.

Actual test results show them needed on shorter engines.

Franklin Railway Supply Company, Inc.
30 CHURCH STREET NEW YORK
332 So. Michigan Avenue
Chicago
625 Transportation Building
Montreal



Spending 145 Million Tons of Coal

Railroad requirements for the next year total 145 million tons of coal.

25 per cent saving in coal or a corresponding increase in ton-mile output comes with Superheating an old engine.

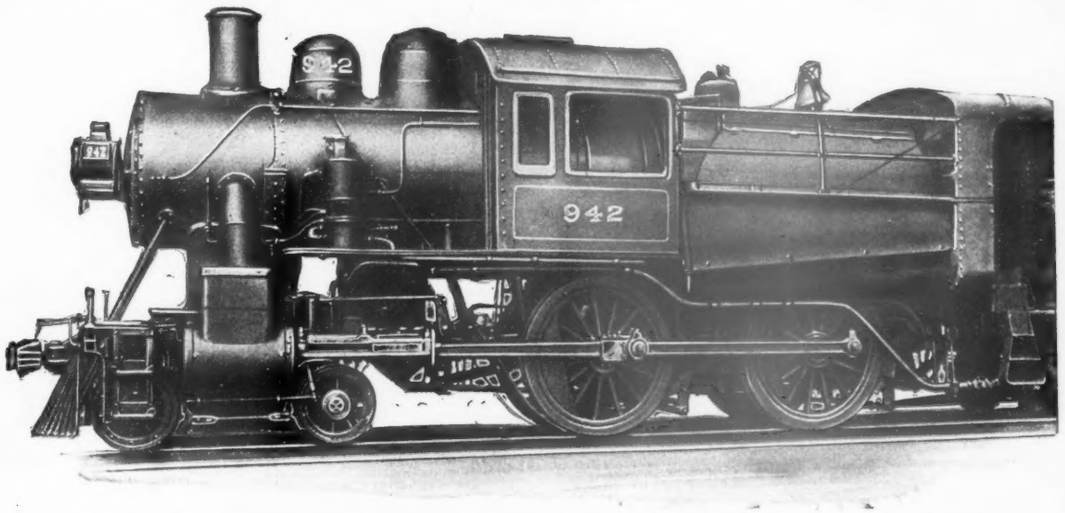
There are still 40,000 old saturated engines running.

Superheating this old power is imperative in this coal and transportation shortage.

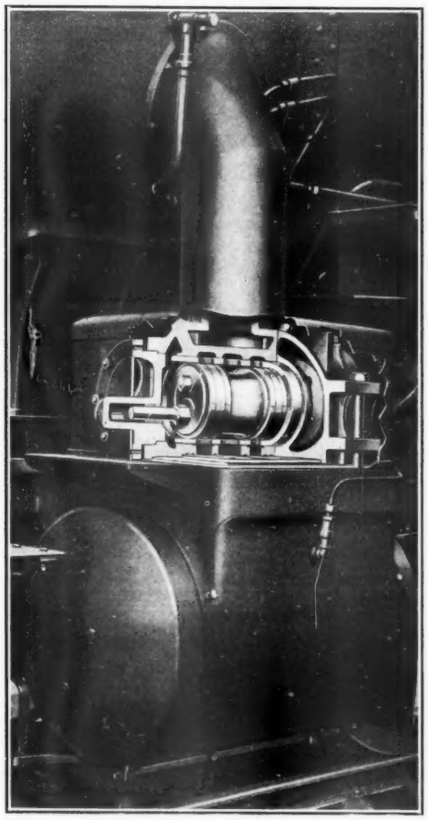
Conversion is only a repair shop job.

LOCOMOTIVE SUPERHEATER CO.

New York Chicago



A GROUP OF OLD LIGHT ENGINES MADE MORE POWERFUL THAN WHEN NEW



Piston valve where slide valve used to be

50 MILLION TONS COAL SHORTAGE

This engine represents a class totalling 7000 old light engines on all roads burning 8 million tons of coal a year.

Universal Valve Chests give a quick means of modernizing these engines to save 2 million tons of coal a year.

Universal Valve Chests eliminate the need for new cylinder castings and frame ends.

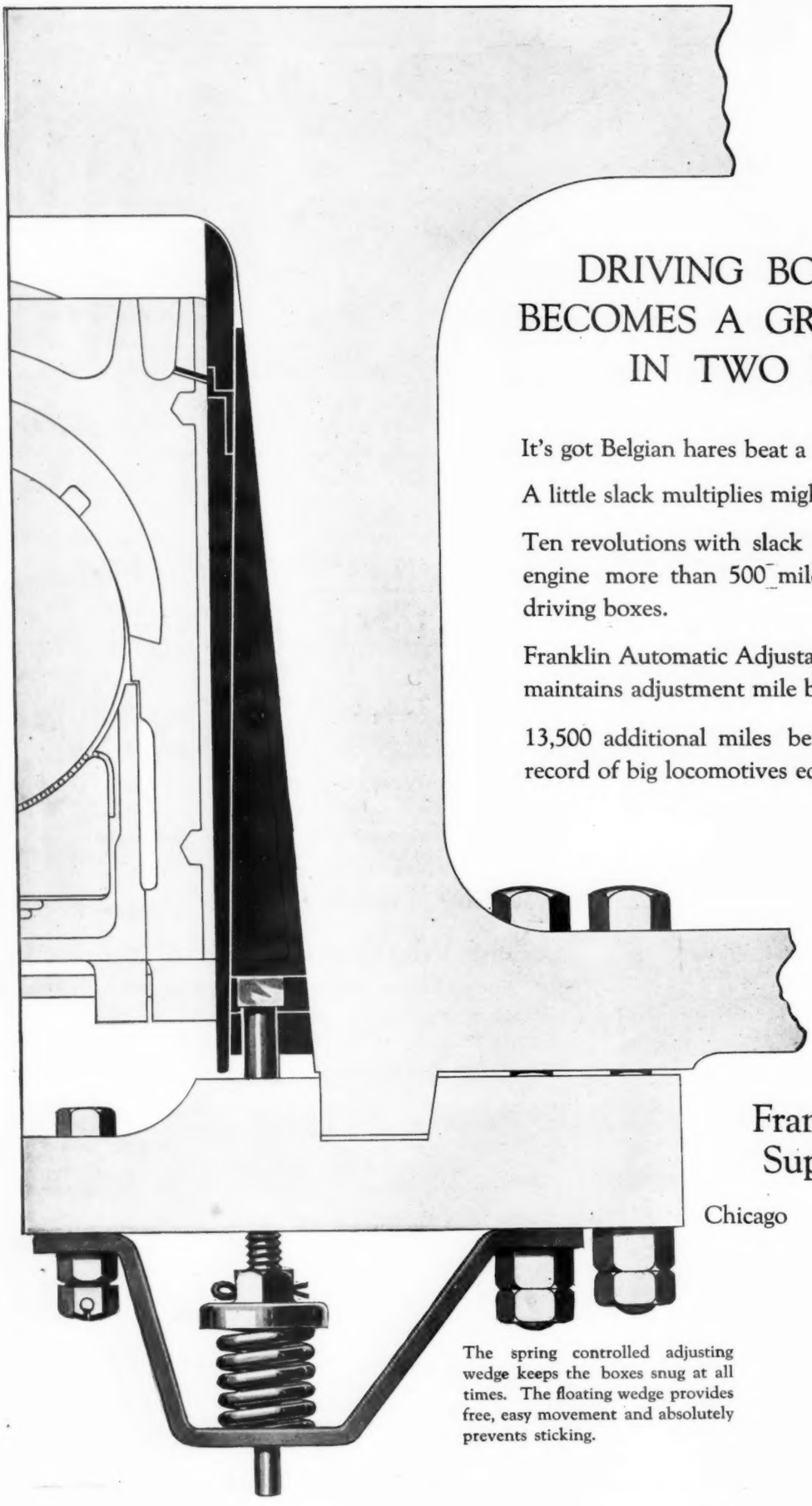
Your own shop is the place and now is the time to do this modernizing.

Franklin Railway Supply Company, Inc.

30 CHURCH STREET NEW YORK

332 So. Michigan Avenue Chicago

625 Transportation Building Montreal



The spring controlled adjusting wedge keeps the boxes snug at all times. The floating wedge provides free, easy movement and absolutely prevents sticking.

DRIVING BOX SLACK BECOMES A GRANDFATHER IN TWO HOURS

It's got Belgian hares beat a city block.

A little slack multiplies mighty fast.

Ten revolutions with slack driving boxes racks the engine more than 500 miles of travel with snug driving boxes.

Franklin Automatic Adjustable Driving Box Wedge maintains adjustment mile by mile all over the road.

13,500 additional miles between shoppings is the record of big locomotives equipped with this wedge.

Franklin Railway Supply Co., Inc.

Chicago New York
Montreal

Bur-r-r-r-r-r-r-r-r

The other day a railroad friend dropped in. He put up a winter picture in words worth telling. He said:

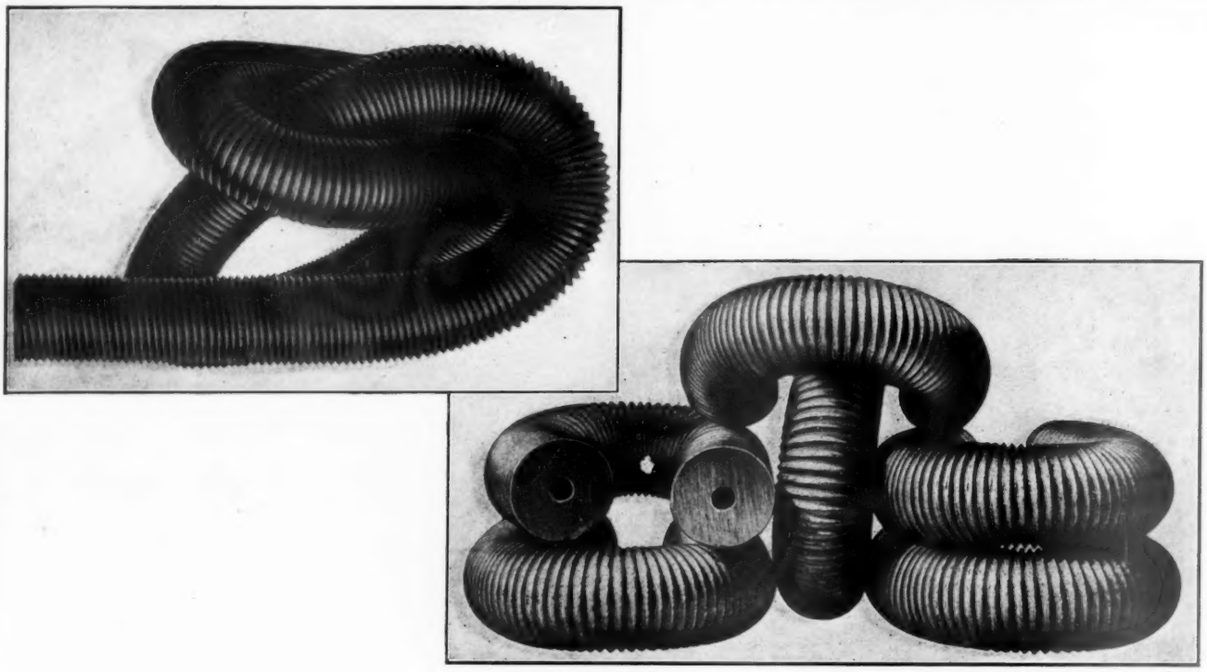
"When engines freeze to the ash pit track, when the round house is frozen up and you can't close the doors, when half of your engines are out pulling in the other half that are dead—then you need arches in your fireboxes."

AMERICAN ARCH COMPANY

Specialists in Locomotive Combustion

McCormick Building
Chicago

30 Church Street
New York



ROME HOLLOW AND ROME SUPERIOR

"I'm right fussy about my staybolt iron."

This remark represents the feeling of a prominent motive power officer.

He knows the necessity of discrimination in boiler material.

He knows the necessity for high quality and uniformly high quality.

Every bar must be as good as the test bar.

Rome Hollow and Rome Superior are both high in quality and uniform.

They both are worthy of your confidence.

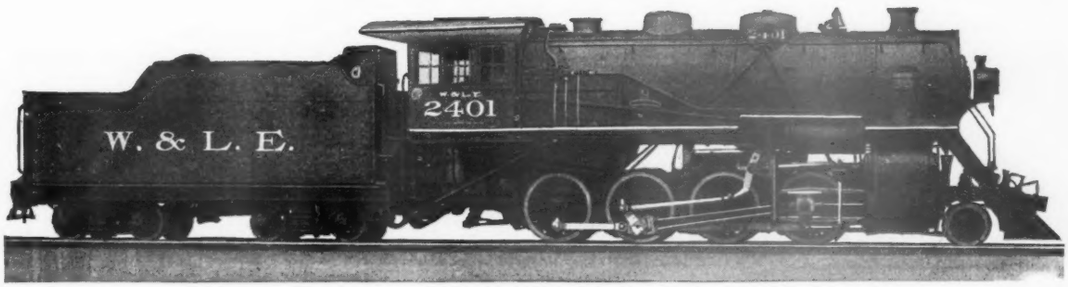
Rome Iron Mills, Inc.

30 Church St., New York

Works: Rome, N. Y.

Rome Hollow
Patented July 3, 1917

WHEELING & LAKE ERIE RAILWAY



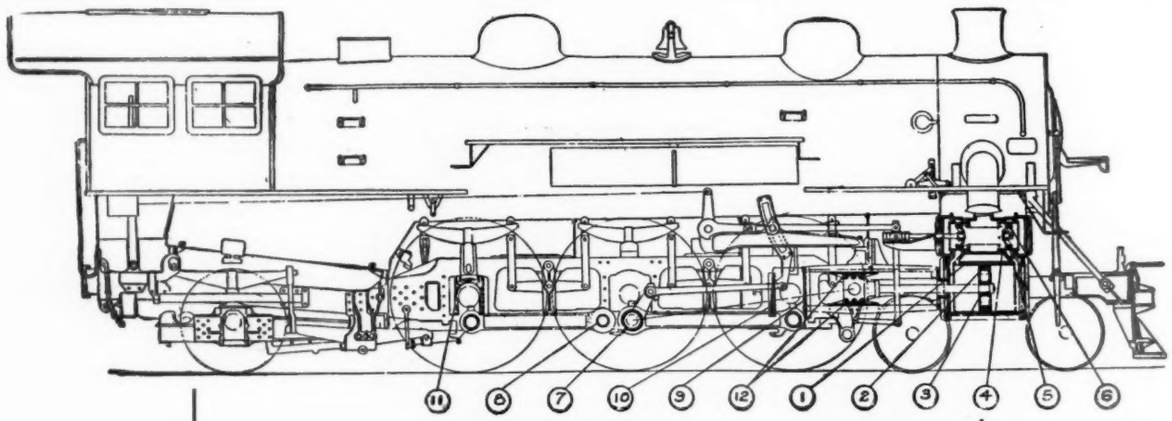
Total Weight of Engine, 266,500 pounds; Weight on Drivers, 236,000 pounds; Diameter of Drivers, 57 inches; Boiler Pressure, 185 pounds; Cylinders, 26 X 30 inches; Maximum Tractive Power, 55,900 pounds.

These engines are operated on the Toledo division between Huron and Brewster, Ohio, a distance of 80 miles. The ruling grade is 0.6 per cent, 5 miles long.

45 cars (44 loaded and 1 empty), 3238 tons, are taken over this division at an average speed of 15 miles per hour.

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK



Hunt-Spiller Gun Iron

for

12 of the Principal Parts of a Locomotive

1. Cylinder Bushings
2. Cylinder Packing
3. Pistons
4. Valve Bushings
5. Valve Packing
6. Valve Bull Rings
7. Side Rod Bushings
8. Knuckle Pin Bushings
9. Pedestal Shoes
10. Pedestal Wedges
11. Driving Boxes
12. Crosshead Shoes

RELIABILITY AND ENDURANCE

Will be obtained in the wearing parts of your locomotives by the application of Hunt-Spiller Gun Iron.

Made Only by

Hunt-Spiller Manufacturing Corporation

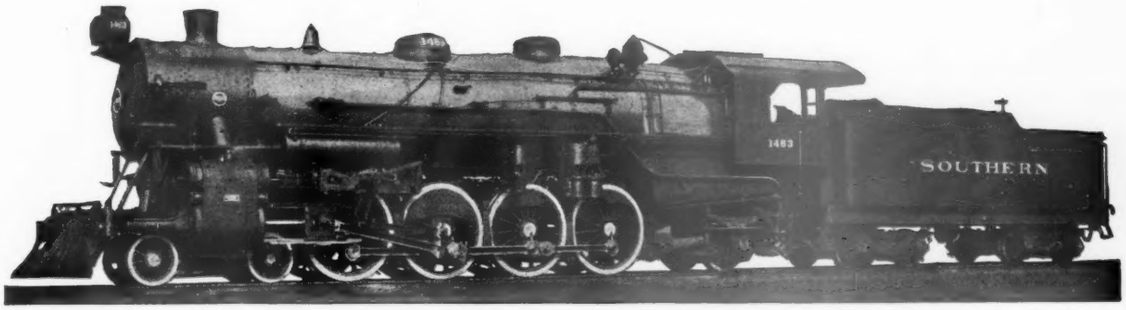
W. B. Leach, Pres. & Gen. Mgr. J. G. Platt, Vice-Pres. & Sales Mgr.

Office and Works

383 Dorchester Ave. So. Boston, Mass.

BALDWIN

Locomotives must be designed to suit the physical and operating conditions on the road for which they are built. This is why, on some railways, eight-coupled locomotives are required to do work which, on other lines, is handled with six-coupled types.



Mountain Type Locomotive, Southern Ry.

J. Hainen, Assistant to Vice-President, in charge of Motive Power Dept.

CYLINDERS—27 x 28 inches.
DRIVING-WHEELS, DIAM.—69 inches.
STEAM PRESSURE—190 lbs.
GRATE AREA—66.7 sq. ft.
WATER HEATING SURFACE—3,668 sq. ft.
SUPERHEATING SURFACE—942 sq. ft.
WEIGHT ON DRIVING-WHEELS—209,800 lbs.
WEIGHT, TOTAL ENGINE—314,800 lbs.
TRACTIVE FORCE—47,800 lbs.

The Mountain (4-8-2) type is specially fitted for heavy passenger service where four pairs of driving-wheels are necessary to safely carry the adhesion weight. The wheel arrangement is safe for fast running. High tractive force can be developed in this type, without using excessive wheel loads.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.

Represented by

F. W. Weston, 120 Broadway, New York, N. Y.
Charles Riddell, 627 Railway Exchange, Chicago, Ill.
C. H. Peterson, 1210 Boatmen's Bank Bldg., St. Louis, Mo.
George F. Jones, 407 Travelers Building, Richmond, Va.
A. Wm. Hinger, 512 Northwestern Bank Bldg., Portland, Ore.
Williams, Dimond & Co., 310 Sansome St., San Francisco, Cal.

Cable Address: "BALDWIN, PHILADELPHIA."

"All new locomotives should be constructed to give maximum service with minimum maintenance. All locomotives being built or modernized should be turned out of the shops prepared to give similar results. Any improvement that can be made to any locomotive, new, modernized or under repairs, which will result in increased service, increased efficiency, or decreased maintenance, will help to increase the capacity of the railroads."—W. H. Winterrowd, Canadian Pacific.

The Canadian Pacific practices what it preaches. They have tried and proved

Vanadium Steel

for the Vital and Vulnerable Parts

to be an effective means of securing increased service and efficiency and decreased maintenance.

Let the above be the keynote for your mechanical department in its efforts to help win the war.

Here is precept and example. Follow them.

American Vanadium Company

NEW YORK PITTSBURGH LONDON

1810 LUKENS 1917

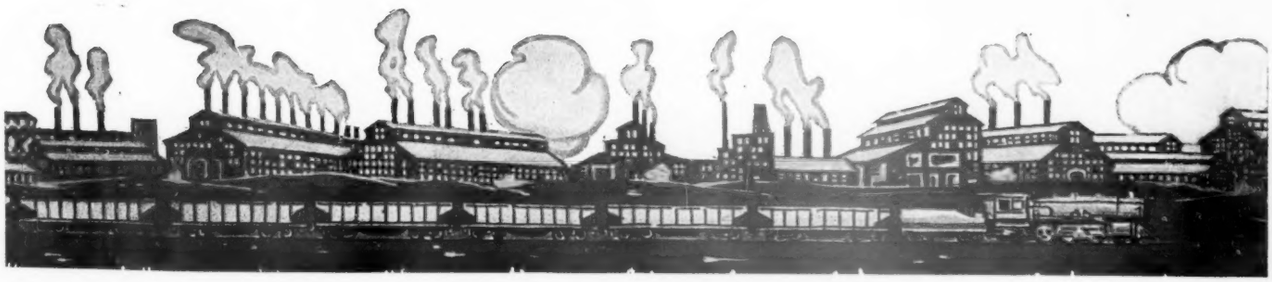
New Plate Mill

THE first of next year will see the world's largest plate mill in operation at Coatesville, Penna. Here the original Lukens Plant was established in 1810; here the first boiler plate in America was made in 1820; and here for the fourth time in its history the Luken's Steel Company will have the largest plate mill in the United States.

Our special knowledge gained in this particular field during more than one hundred years has enabled us to design this mill which will produce plate, if possible, even more than ever true to the now well-known phrase which long ago became a maxim:

Lukens Signifies Quality

LUKENS STEEL CO.
Coatesville - - - Penna.



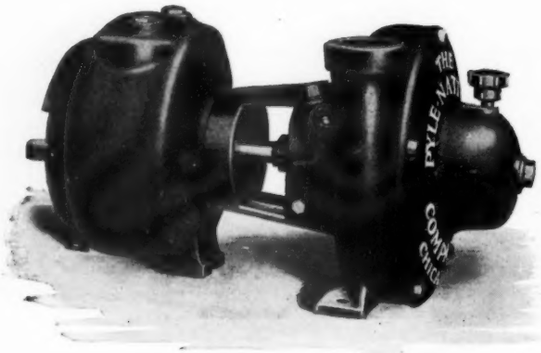
"There *IS* Light"

When you want it

As you want it

Where you want it

If it is a Pyle-National



Type E-2 Turbo-Generator—500 Watts

Special Lamp Case, 14 and 18 Inches

The Pyle-National Company

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Mutual Bldg.,
Richmond, Va.

Robert C. Shaal
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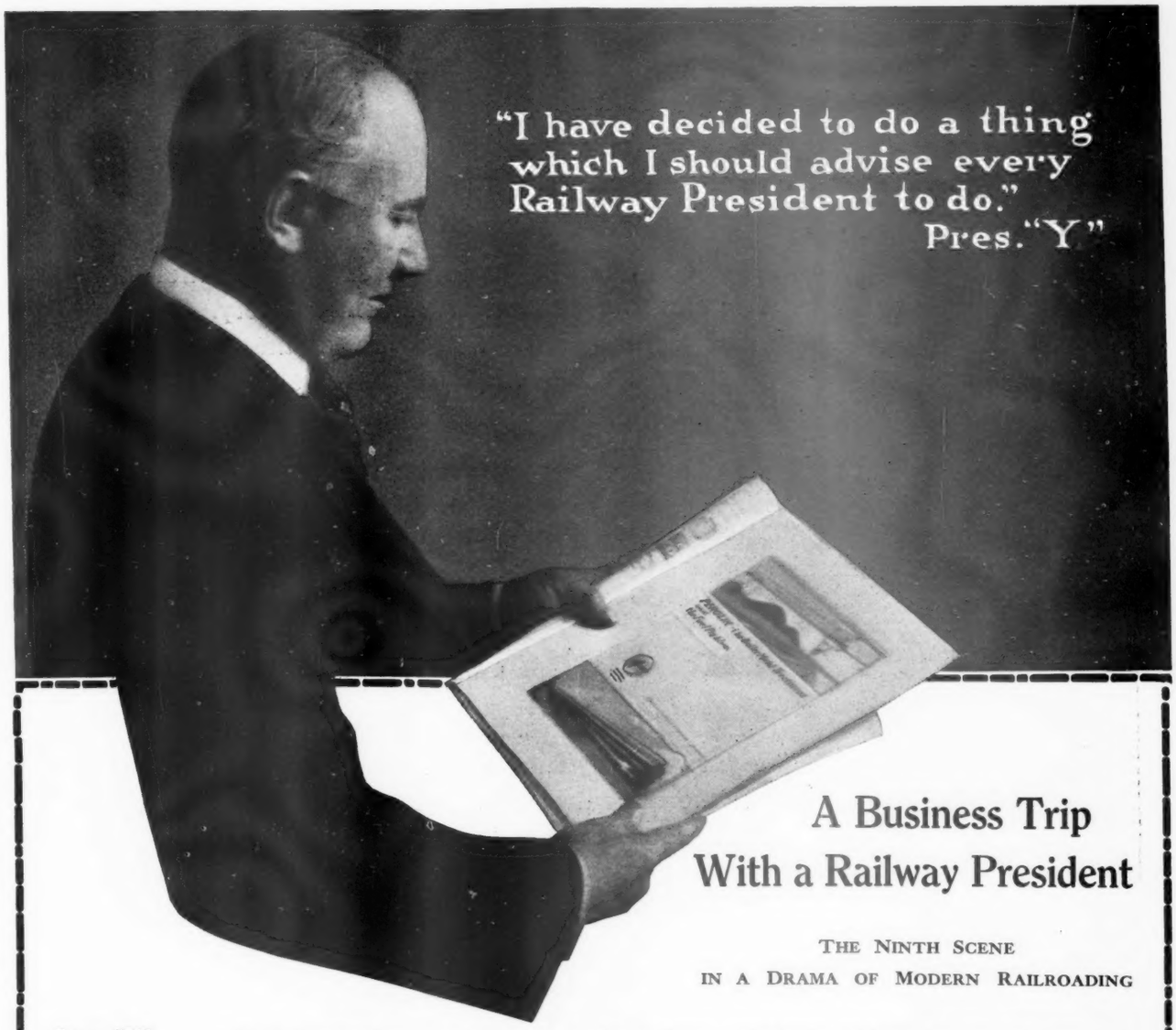
New York

N. S. Kenney
1014 Munsey Bldg.,
Baltimore, Md.

The Holden Company, Ltd.
354 St. James Street,
Montreal, Quebec, Canada



A Business Trip With a Railway President

THE NINTH SCENE
IN A DRAMA OF MODERN RAILROADING

PRES. "Y"— "Well, I started out to do a thing which railway presidents seldom do—go out over the road and investigate actual conditions, and from what I have seen, I have decided to do a thing which I should advise every railway to do—investigate Perolin—the Boiler Metal Treatment.

I've seen what boiler scale can do, has done and is doing to increase our Maintenance of Equipment expense, and now I'm going to accept that invitation the Perolin Railway Service Company extended in their advertisement in the *Railway Age Gazette* for October 26th—give them an opportunity to prove *all* their statements on our locomotives and under our own operating conditions.

I have wired Mann that I will be back tomorrow, and that I am bringing back with me the solution to that vital problem of American railways today—clean locomotive boilers and locomotive boilers kept clean."

These close-ups of President "Y" and Vice-President Mann would seem to indicate that the U. N. P. & B. is close up to the wise solution of the scale problem, but read this page next week and see.

Perolin — The Boiler Metal Treatment

We maintain a service department of mechanical experts. A letter to P. E. Rolin in our care, and it is at your service.

Perolin Railway Service Company

General Offices, Railway Exchange Building, St. Louis

Chicago Office
Peoples Gas Building

G. F. Cotter Supply Company
Southwestern Representatives
Southern Pacific Building, Houston

Eastern Office
Woolworth Building
New York

Make Your Old Power Do Its Bit

You can't build locomotives immediately. You can't buy locomotives immediately. You must get along with the power you have. You must force your old power to its elastic limit to meet present traffic conditions.

You can get the maximum efficiency from your locomotives by scrapping those old fashioned inside valve gears and replacing them with

The Baker Valve Gear

—the modern outside valve gear. It takes no longer to apply the Baker than it does to repair the old valve gear. Besides, the Baker is guaranteed to give a 5% increase in pulling capacity, with a 50% decrease in fuel consumption, and this with lower maintenance costs.

The Time to Apply the Baker Valve Gear is NOW

Write for a copy of the Guarantee

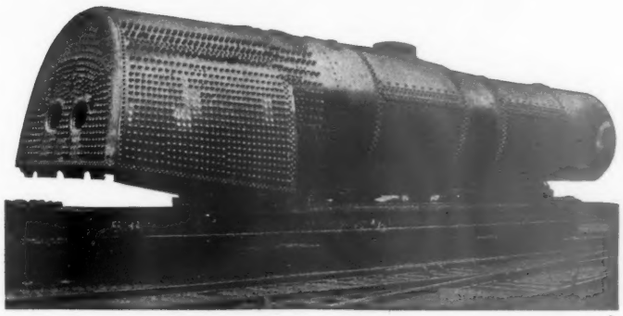
Are you using the "Sentinel" Low Water Alarm? If not, let us talk it over.

BAKER VALVE GEAR
Over 4,500 in Service

THE PILLIOD COMPANY

30 Church Street, New York, N. Y.

Western Representative—Mudge & Co., Railway Exchange, Chicago, Ill.



The Modern Locomotive Firebox

With Tate Flexible Staybolts Applied

Extended areas of heating surface in modern locomotive fireboxes, so essential to the greater supply of steam, necessarily demands that suitable means should be provided, in the method and application of the connecting members to the firebox structure, that will amply accommodate the inequalities of sheet expansion and thus allow the firebox to expand under the least restriction.

The zone of greatest expansion between the firebox sheets and the outer shell is closely defined by the rigid staybolt breakages that invariably occur, resulting from the destructive effects of a too rigid connection.

Staybolt breakage and fire sheet cracking can be largely eliminated. A too rigid staying of the firebox reduces the material structure to a state of inactivity, for when firebox plates are restricted and not allowed to expand in a natural course, gradual deterioration of the material structure, due to repeated bendings and the buckling of the sheets, results in cracks that develop into fractures which are liable to be far reaching in their effects, thus requiring vigilant and constant attention, resulting in the occasional withdrawal of engines from service.

The **TATE FLEXIBLE STAYBOLT,** in use on the major portion of the railroads, has successfully demonstrated its true value as a most suitable medium to employ, that will in a larger measure accommodate the irregularities of sheet expansion, with less resulting effect on either the stays or sheets, under the stress of firebox expansion. In many of the larger installations of the Tate bolt, staybolt breakage has been reduced to an inconsiderable amount, and in some instances entirely eliminated, and side sheets and rivet seams show no evidence of strain whatever, covering periods of service of five years and over.

Engine mileage increases as the cost of firebox repairs and maintenance decreases. This is a fact, and a condition that has not been lost sight of by those who were observing enough to follow the cost of firebox maintenance, as well as to point to the means that enabled them to obtain economic results, and it has been found in all instances where the Tate Bolts were applied to locomotive firebox boilers, that greater service and a lower cost of maintenance have prevailed, and partial installations where formerly made, soon led to larger installations, which in each instance were fully justified by the results obtained.

In comparison with the rigid staybolt the complete results obtained over many years in locomotive firebox service, contain conclusive evidence that the Tate Flexible Staybolt is far superior to the rigid stay in present day practice, and is a most practical and economic factor in conserving the material life of the complete assemblage for greater and more constant service.

IN USE ON OVER 500 RAILROADS

FLANNERY BOLT COMPANY

VANADIUM BUILDING, PITTSBURGH, PA. **B. E. D. STAFFORD, Gen. Mgr.**

J. ROGERS FLANNERY & COMPANY, Selling Agents

Vanadium Building, Pittsburgh, Pa.

GEO. E. HOWARD
Eastern Representative

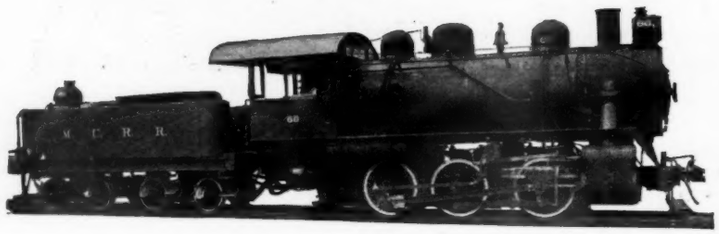
W. M. WILSON
Western Representative

COMMONWEALTH SUPPLY CO.
Southeastern Representatives

CHAS. HYLAND
Boiler Expert

5

Six-Wheel Switchers For Quick Delivery



We have several sizes of these locomotives under way and can give unusual deliveries.

Write for catalog of light and heavy

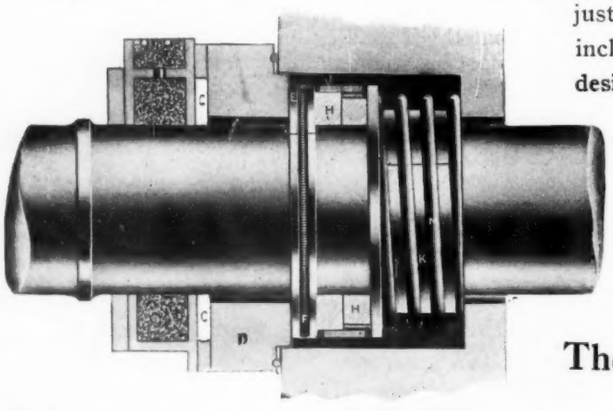
LOCOMOTIVES

H. K. PORTER CO. **1214 Union Bldg., Pittsburgh, Pa.**

Rod Wear and Packing

Wear must occur with any effective design of rod packing, but the rate of wear and the uniformity of its distribution over the rod's surface are items which must not be overlooked when considering the merits of a packing. Grooving of the rod, uneven wear and distortion of the rod's cylindricity are results of incorrect design, bad manufacturing methods or foundry practice, or unwise metallurgy.

Mitchell Metallic Packing employs no wedge rings, vibrating cups or cones. Rings are of rectangular cross-section and joints normal to the rod and easily maintained. All parts are adjustable to the reduction of the rod one-quarter inch or the life of the rod. Mitchell Packing is **designed right.**



Mitchell Metallic Packing is machined to micrometers—it is **manufactured right.**

Mitchell Metallic Packing must be metallurgically right when it can stand up in superheated steam service until it is so thin that it crumbles when being removed.

The Paxton-Mitchell Company
Omaha, Neb., U. S. A.

RAILWAY
STEEL-SPRING
COMPANY
GENERAL OFFICES
30 Church St., New York.
BRANCHES
Chicago
Denver
Detroit
Louisville
Mexico City
St. Louis
St. Paul
Norfolk
New Orleans

Headlight Service

THE real test of any headlight is service. No matter what the requirements are, the most economical headlight is the one that is constructed with due consideration for service under all conditions. Specify

"GLAZIER" HEADLIGHTS

Cases—Reflectors

All Sizes

All built for real service. Consult us as to your requirements

The Glazier Headlight Mfg. Company
Rochester, N. Y.

Oscar F. Ostby, Mgr. of Sales
2736 Grand Central Terminal, New York, N. Y.
Western Representative
J. H. Sharp, McCormick Building, Chicago, Ill.

Send For Our New Booklet On The Subject Of Water As Used For Steam Making

The subject is one that cannot be dealt with adequately in the limited space of an advertisement.

This booklet explains **the causes of Corrosion, Incrustation, Foaming and other troubles, and offers a scientific solution of these difficulties.** We believe it will make you realize more fully than you do already, how destructive of boilers and boiler efficiency untreated feed waters may be.

We believe a study of the booklet will also convince you that we are capable of dealing with the proposition in the most effective manner.

In case you are experiencing trouble from the use of bad water supplies in your locomotives, send gallon samples of the waters for analysis, and let us advise regarding treatment.

Let us have your address and the booklet will be forwarded at once.

DEARBORN CHEMICAL COMPANY

General Offices, 332 South Michigan Avenue, Chicago
Laboratory & Factory, 1029-1037 West 35th Street, Chicago

AN AUTOMATIC STOP
—with additional features—
but without complications.

Brings the signal into the cab, prevents running red boards, keeps the speed below the prescribed limit thus reducing track maintenance and motive power upkeep expense.

Write for details.

Julian-Beggs Signal Co., Terre Haute, Ind.

Reversible Stop Boiler Check Valve

This valve may be used for either the right or left side of the boiler. It is in convenient form to get at the check valve and seats readily for inspection and grinding. Provided with removable check-stop on top for small repairs to seat and check. Just remove the top and take out check without disturbing pipe connections below as you would have to do with other valves.

Injectors, Lubricators and Locomotive Appliances

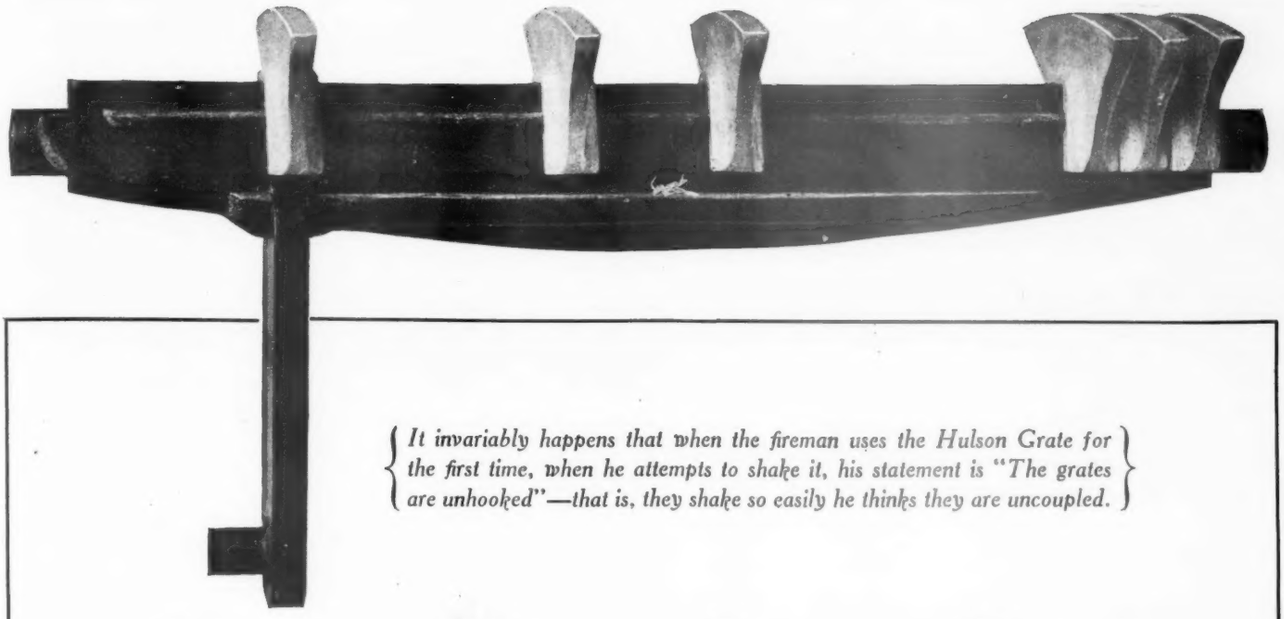
Descriptive Catalog on request.

NATHAN MANUFACTURING CO.
FLUSHING, L.I. NEW YORK

Western Office: 1612 Old Colony Building, Chicago
St. Louis Office: Frisco Building

SOLE AGENCY OF THE COALE MUFFLER SAFETY VALVES

9



It invariably happens that when the fireman uses the Hulson Grate for the first time, when he attempts to shake it, his statement is "The grates are unhooked"—that is, they shake so easily he thinks they are uncoupled.

Clean Fires Save Coal

Carrying too heavy a fire is usually due to one thing—grates hard to shake. Very often you see both fireman and engineer using their best efforts on the shaker bar in order to get results. On a great many roads the firemen are demanding steam shakers on the larger engines.

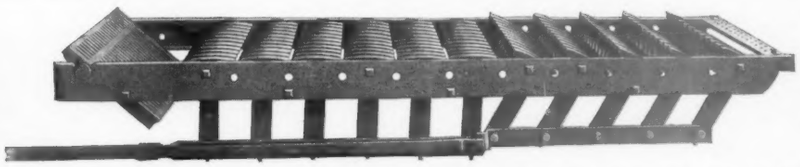
It is certain that with grates difficult to shake, the engines will come into the terminal with deep fires often full of clinkers. In this condition, there is not enough air passing through the fuel bed to insure complete combustion, consequently there is a serious waste of coal.

There are two things that make the Hulson grate easy to shake—proper leverage, and fingers curved across the top. The curved top gives a rubbing action to the under side of the fire, instead of raising and lowering as with the flat-top grate bar. There is more of a rolling motion which frees the fire of fine ash and keeps it clean.

Always think of the Hulson Grate as a coal saver. We guarantee a 10% saving of fuel.

Hulson Grate Company

Keokuk, Iowa



Easier shaking, cleaner fires, less clinkers, and cooler grates result from this construction.

"DUPLEX" LOCOMOTIVE STOKERS
For Firing Lump Coal

STREET LOCOMOTIVE STOKERS
For Firing Slack Coal

These Stokers Are Firing 1,700 Locomotives on 30 Railroads

LOCOMOTIVE STOKER CO., MAIN OFFICE AND WORKS: PITTSBURGH, PENNA.
50 Church St., New York. Railway Exchange, Chicago

ELIMINATING TESTS

Look For

The Name

¶ "NATIONAL" Pipe is subjected at the mill to severe tests which eliminate all material which shows any defect.

¶ These mill tests prepare "NATIONAL" Pipe to withstand even extraordinary accidents without fracturing the material.

¶ Some interesting examples will be shown on a page in next week's issue.

NATIONAL TUBE COMPANY **PITTSBURGH, PA.**

FOSTER
Locomotive Superheater
Power Specialty Co. 111 Broadway, New York

FEDERAL BOILER INSPECTION
EASILY TAKEN CARE OF BY
FALLS HOLLOW STAYS

They eliminate drilling expenses and make unfailing tell-tales on fractured or broken stays. They possess double the endurance of Solid Stays, and are a proof without test against broken stays.

FALLS HOLLOW STAYBOLT CO., Cuyahoga Falls, Ohio, U. S. A.

1

"Scale removing was never like this," recently said an engineer after he had tried out

Dixon's *Pioneer* Boiler Graphite

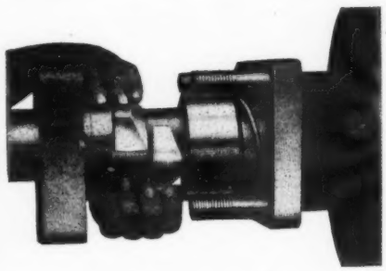
The Boiler Graphite that gives results

Time and money saved in cleaning boilers brought forth the above exclamation. Send for booklet 105-T.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON Crucible Company

Established 1827 T-42



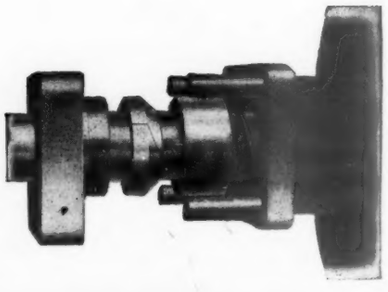
Keep More Locomotives in Revenue Service!

You can keep more locomotives in revenue service—you can insure your equipment against steam leaks by the use of

KING METALLIC PACKING

—The packing of extreme simplicity together with the best materials and the most careful workmanship—with records proving its claims of superiority in performance—economy and service.

Packing ring of TWO parts which interlock when in position on rod.



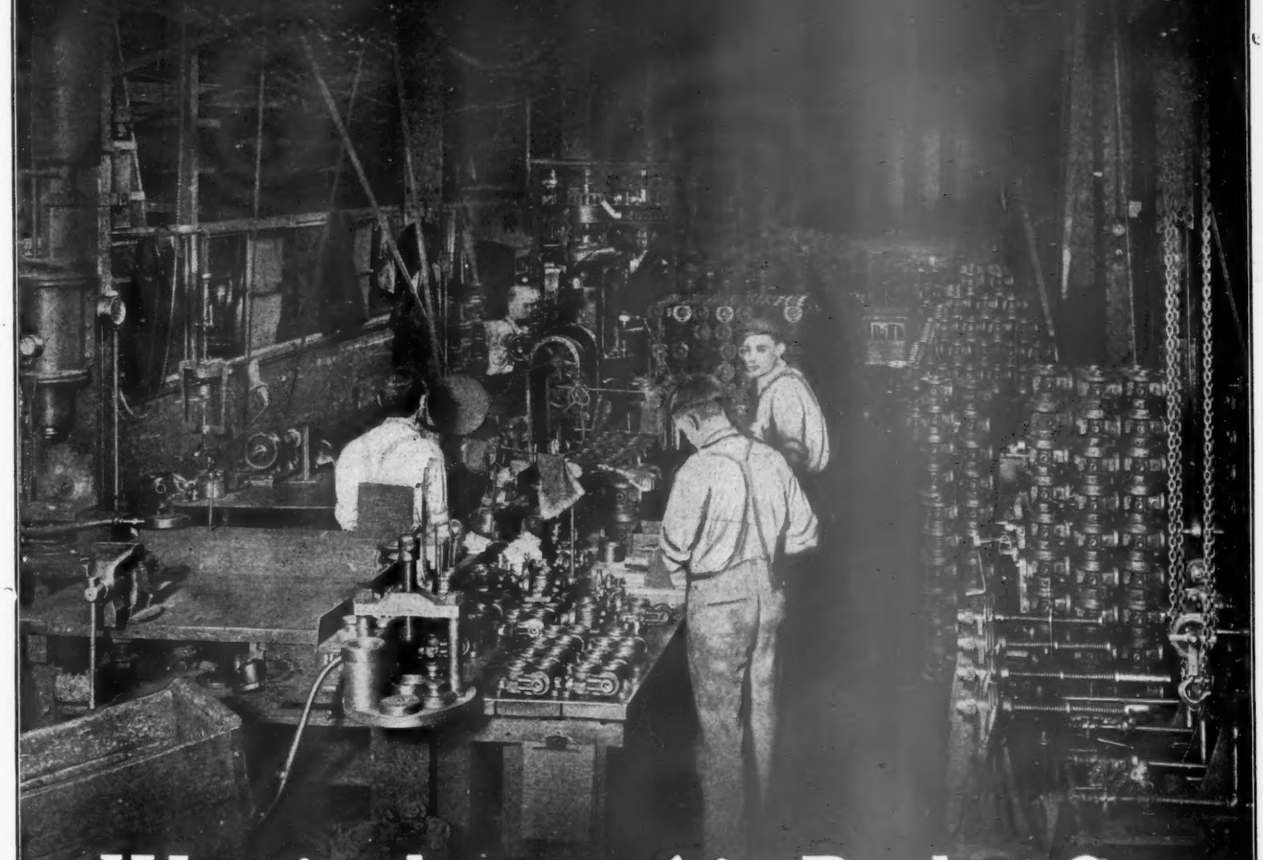
The United States Metallic Packing Co.
Philadelphia **Penna.**

Triple Valve Repair Work

Extensive repairs to triple valves are made more efficiently and economically by the manufacturer because of large volume of work handled, special machinery, scientific organization, complete shop facilities and skilled, trained workmen.

Arrangements exist whereby we make shipment from stock of repaired triple valves in equal number upon receipt of notice by railroad that a shipment of triple valves is being returned to our factory for repairs, thus saving the railroad company the time required to actually make the repairs.

Similarly we handle repairs of feed valves, governors, brake valves and other valvular parts of the air brake. This releases to the railroads manpower for other necessary work consequent upon existing war time conditions.



Westinghouse Air Brake Co.

General Office and Works, Wilmerding, Pa.

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Columbus, O.
Denver, Col.
Houston, Tex.
Los Angeles,
Mexico City
New York, N.Y.
Pittsburgh, Pa.
San Francisco.
Seattle, Wash.
St. Louis, Mo.
St. Paul, Minn.

FROGS

CROSSINGS SWITCHES, SWITCH STANDS
FOR
MOST SEVERE USE
WE SPECIALIZE ON THIS GRADE OF WORK

CLEVELAND FROG AND CROSSING CO.
CLEVELAND, O.

The Tyler Tube & Pipe Co.

KNOBBLED CHARCOAL IRON
LOCOMOTIVE BOILER TUBES

Works and General Offices: Washington, Pennsylvania

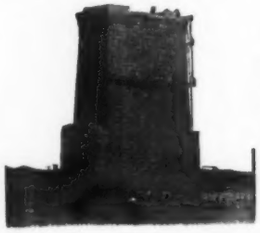
New York Office:
GEO. E. MOLLESON
30 Church Street

Chicago Office:
SPENCER OTIS CO.
1707 Railway Exchange Bldg.

The Mo. Valley Bridge and Iron Co.

LEAVENWORTH, KANS.

Engineers, Manufacturers and Builders



of Bridges, Girders, Viaducts, Turntables, Trestles, Roofs, Steel Water Tanks for Buildings, Sub-structures, Pneumatic Piers, Deep Foundations, etc.

The Rail Joint Company

61 Broadway, New York City

100% Rail Joint

Continuous, Weber, Wolhaupter and 100% Rail Joints.
Standard—Insulated—Step—Frog and Switch
Protected by Patents.

Grand Prize, San Francisco, 1915

4

American Wire Rope

FOR elevators, dredges, lumbering, mining, oil-well drilling, suspension bridges, stump-pulling, cranes, derricks, ships' rigging and every other form of wire rope use.

Ask for Illustrated Catalogue

American Steel & Wire Company

Chicago New York Cleveland Pittsburgh Worcester Denver
Export Representative: U. S. Steel Products Co., New York
Pacific Coast Representative: U. S. Steel Products Co.
San Francisco Los Angeles Portland Seattle

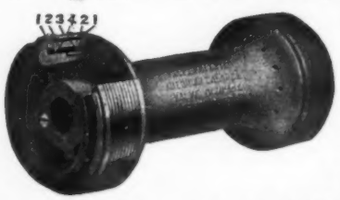
Dexter P. Lillie Co.

Cotton and Wool
WASTE

Manufacturers of
Wiping and Packing Waste

INDIAN ORCHARD
MASSACHUSETTS

Super-Heated Steam



SEMI-PLUG VALVE
THE ONLY
Steam Tight Valve
THE ONLY
Frictionless Valve

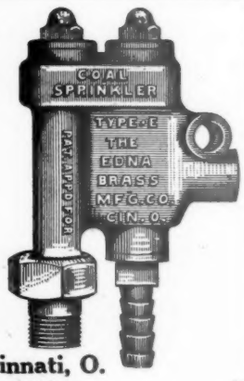
The ONLY Valve which is MAINTAINED by DUPLICATE PARTS from STOCK

American Balance Valve Co.
Jersey Shore, Penna.

BALANCE VALVE SPECIALISTS SINCE 1890 1

COAL SPRINKLER!

The Edna Type "E" Lifting Coal Sprinkler fills a want for "Safety First." Handles water at a very low degree of heat.
No scalding or burning with steam or water possible.
Is automatic in action.
No other Sprinkler on the market has a wider range of action and is mechanically constructed for repairs without removal from pipes.
Will throw a stream of water 25 ft. with ¾" hose nozzle.
Prices and details furnished on request.
We manufacture a complete line of Injectors, Lubricators, Boiler and Line Check Valves, Reflex Water Gauges and other brass locomotive appliances.



The Edna Brass Mfg. Co., Cincinnati, O.
CHICAGO OFFICE: 551 McCormick Building 10

The Issues in Goodyear Tank Hose

WE know you believe with us that great rewards await the manufacturer of rubber goods for railway use who is anxious and able to get business on a new basis.

We believe that you realize as clearly as we do that that new basis has two essential issues:

I. To study railroad requirements with the railroad point of view and fill them with resources and technical knowledge that only a great company specializing in the manufacture of railroad rubber goods can furnish, and

II. To be willing unreservedly to stake reputation and future business on the performance and economical service of the goods thus produced.

In presenting our newly perfected Goodyear Tank Hose to you both issues are involved.

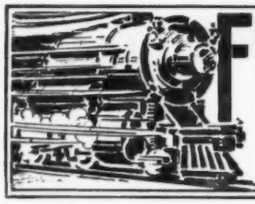
The first, in view of the tendency toward railroad specification to the minutest detail, may interfere temporarily with sizable purchases of this hose.

But no matter what your purchasing regulations may be, they will not interfere with your placing a "proof" order for this hose and subjecting it to exacting service tests.

We are willing to stake our reputation and business with you on its lasting quality, freedom from "permanent set," right price, and enduring economical service.

Our special representatives in all railroad purchasing centers will call at your request to submit a sample and to explain its specifications and construction.

The Goodyear Tire & Rubber Company, Akron, Ohio



FUEL SAVING

International Water Softeners insure energy from every pound of coal burned. Watch for details in large ads in following issues.

INTERNATIONAL FILTER CO., INC.
Water Softening and Filtration Plants
Chicago New York

AXLES
FOR PASSENGER OR FREIGHT CARS AND LOCOMOTIVES
"Pollak" Special Heat Treated Steel. Open Hearth—Nickel or Vanadium Steel

FORGINGS
MARINE MACHINE AND ENGINE
From 10 lbs. to 100,000 lbs. each of every shape and Description

THE POLLAK STEEL CO. Cincinnati, O.

G. S. BAXTER & Co.
13 WILLIAM ST., NEW YORK
(TELEPHONE CONNECTIONS)
JACKSONVILLE, FLA.

DIMENSION
RAIL X TIES
CROSS X ROAD
BRIDGE TIES, SWITCH TIES
LUMBER

BRONZE METAL COMPANY
Owners and Manufacturers of
VIM METAL FOR BEARINGS
Manufacturers of Brass, Bronze, Composition Castings and Babbitt Metal
30 CHURCH STREET - - NEW YORK

Specify **BUCKEYE JACKS**
and be assured that you are getting the best jack in design, capacity and longevity that is manufactured
Send for Catalogue
BUCKEYE JACK MFG. CO. ALLIANCE OHIO

Damascus Bronze Company
Pittsburgh
Unconditionally guaranteed to give 50 per cent. greater mileage and not to heat or cut the axle or pin
DAMASCUS NICKEL BRONZE
THE UNEXCELLED RAILROAD ALLOY
Quotations and complete information on request

The Burden Iron Company
Troy, New York
A Century's Experience in Making High Grade Iron
Iron Rivets, Engine Bolt Iron, Staybolt Iron
"HB & S" & "B.BEST"

U.S. CAST IRON PIPE
Unusual Facilities For Prompt Shipment
UNITED STATES CAST IRON PIPE & FOUNDRY CO.
General Offices - Burlington, N.J.

TIE PLATES *Send for Catalogue*
MANUFACTURED FROM NEW STEEL BILLETS
WORKMANSHIP AND MATERIAL GUARANTEED
THE RAILROAD SUPPLY COMPANY
BEDFORD BUILDING, CHICAGO

WYCKOFF PIPE AND CREOSOTING CO., Inc.
Established 1881.
Send for Catalogue "H."
30 East 42d St., New York
WYCKOFF
TREATED TIES
WILL NOT DECAY
Paving Blocks, Conduits, Signal Posts, Signal Wire Casings, Steam Pipe Casings, Wood Pipe, and all forms of creosoted wood.
Creosoting Works and Factory: PORTSMOUTH, VA.

P&M and Vaughan Rail Anti-Creepers
THE P&M CO.
Railway Exchange, Chicago.
San Francisco Denver New York

TOCH BROTHERS
Est. 1848
INVENTORS AND MANUFACTURERS OF
T.I.W.
Technical Paints, Varnishes, Enamels, Etc.
329 FIFTH AVE. NEW YORK

B. A. Hegeman, Jr., President
Charles C. Castle, First Vice President E. D. Hillman, Secretary and Engineer
Harold A. Hegeman, Vice Pres. and Treas. Fred C. Dunham, Assistant to President

National Railway Appliance Co.
50 East 42nd St., New York City

HEGEMAN-CASTLE CORPORATION Chicago
NATIONAL RAILWAY APPLIANCE CO. Washington, D. C.

RAILWAY SUPPLIES

Selling Agents for: Dunham Hopper Door Device—Feasible Drop Brake Staff—Anglo American Varnishes—Axles and Forgings—Paints and Enamels—Kelly Brake Jaw—Electric Arc Welders—Linofelt—Fibrofelt—Lith.—Elastic Car Waste—Garland Ventilators—Perry Side Bearings.

General Eastern Agents for Hutchins Car Roofing Co.
Special Agents for the Tool Steel Gear & Pinion Co.
Special Agents for C. & C. Electric & Mfg. Co.
General Eastern Agents of the Union Fibre Co.
Special Agents for Holden & White-Johnson Fare Box Co.
Eastern and Southern Agents for Valley Steel Co.

ADVERTISEMENTS appearing in Railway Age Gazette are read by the men who authorize and make purchases for American railways.

POSITIONS WANTED

POSITION WANTED as Master Mechanic or General Foreman. Not only familiar with shop work, but have had considerable experience in the engineering department, test work, fuel studies, etc. More than 20 years' experience with some of the leading railroads of this country. References the very best. Write Box 764, care Railway Age Gazette.

COMPTROLLER, AUDITOR or SUB-AUDITOR. Age 41. Health, habits and personality excellent. Twenty-one years' accounting experience with large and small lines. Holding official positions for past 16 years, present one 7 years as head of accounting department 600 mile line. Thoroughly experienced with interdivisional and underlying companies' accounts. Will accept position $4,000 with good future. Address Box 707, Railway Age Gazette, Transportation Building, Chicago, Ill.

POSITION WANTED as general manager or superintendent of a short line railroad, thirteen years' experience in transportation and maintenance of way departments. Now employed as superintendent and can give good reference. Address Box 721, Railway Age Gazette, Woolworth Bldg., New York, N. Y.

POSITIONS WANTED

POSITION WANTED as assistant to executive operating officer. Twenty-five years' experience in operating department in various capacities, including chief dispatcher, trainmaster and assistant superintendent. Qualified for position requiring knowledge of economical railroad operation. Address Box 695, Railway Age Gazette, Woolworth Bldg., New York, N. Y.

WANTED—A position managing a medium sized railroad anywhere. Desire proposition presenting difficulties where there is opportunity to make showing and expand. Accustomed to operation, construction, organization, and facility towards friendly relations with railroad commissions and public and familiar with traffic matters, divisions, traffic and operating contracts. Twenty years' experience, many large and small railroads. Thirty-seven, married and anxious to become connected with good people financially able, who can appreciate and reward economical, careful, successful management. Now employed as general manager small line where outlook is insufficient. Can give excellent references as to ability and character. Would like interview anyone interested. Address Box 694, Railway Age Gazette, 608 S. Dearborn St., Chicago, Ill.

POSITIONS WANTED

SITUATION WANTED—By practical man, now in charge of Operation, Traffic, Purchases and Accounting of a Western Short Line. Capable of taking charge as Manager, and has the ability to get results. Knows the railroad problems, and is familiar with all the details of departments named, including Interstate Commerce Commission requirements, etc. Would particularly like to take charge of a property which desires to make a better showing as between revenues and expenses, or which needs rebuilding. Address Box 765, Railway Age Gazette, 608 So. Dearborn St., Chicago, Ill.

WANTED—Position as chief clerk to superintendent motive power or master mechanic. Fifteen years' experience in mechanical department as storekeeper and chief clerk to master mechanic. Thoroughly familiar with all details. Age 35, married. Present salary $110.00. Address Box 762, care Railway Age Gazette, Woolworth Bldg., New York, N. Y.

POSITIONS OPEN

IF actually qualified for salary between $2,500 and $25,000, communicate with undersigned, who will negotiate strictly confidential preliminaries for such positions, executive, administrative, technical, professional; all lines. Not an employment agency; undersigned acts in direct confidential capacity, not jeopardizing present connections. Established 1910. Send name and address only for explanatory details. R. W. Bixby, B. 1 Niagara Square, Buffalo, N. Y.

EDUCATIONAL

THOSE interested in increasing their knowledge of practical railroad work should send for our Free Special War Bulletin, describing our instructional methods. $1.50 per month covers all expense for text books, instruction, etc. Investigate this opportunity to increase your earning capacity. The Railway Educational Bureau, Omaha, Nebr.

Tank Cars For Sale

We offer for immediate delivery 19 steel underframe, 6,300 gallon capacity Tank Cars.

Penna. Equipment Co.
1420 Chestnut St., Phila.

"Rails"

We have in stock ready for immediate delivery, in sections from 8 lb. to 85 lb. per yard, and in quantities from a carload to 50 Track Miles. Good Service, Attractive Prices. Also New Spikes, Bolts and Switch Material. Write us.

National Steel Rail Co
1030-32 Pierce Building
ST. LOUIS, MO.

NEW STEEL TANK CARS

8,000 Gallon Capacity
100,000 lb. capacity all steel trucks
January delivery

Horace M. Wigney
750 Railway Exchange Bldg.
Chicago, U. S. A.

PILE DRIVER

One Interstate modern revolving type, self-propelling pile driver, thoroughly overhauled.

LOCOMOTIVES

One 19" x 26" Baldwin 70-ton Consolidation, 44" centers.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

WANTED

A MAN to assist in the revision of the Car Builders' Dictionary; must understand the design and construction of cars.

A MAN familiar with the work of the electrical department on steam railroads.

For additional information apply to Roy V. Wright, Room 2201, Woolworth Building, New York City.

85 lb.
A. S. C. E. RELAYERS

16,000 tons—with Angle Bars to match.
Available immediate shipment and centrally located.
We positively own these Rails and offer same in carload lots and over.
25,000 tons—Relayers—sizes 25 lb. to 100 lb. in stock, our Pittsburgh yards and vicinity.
Immediate shipment guaranteed and prices very attractive.
Carload and less carload inquiries and orders solicited.
Rails cut to length for structural purposes.
Frogs, Switches, Bolts, Nuts, Spikes and all Accessories.

L. B. FOSTER COMPANY
Park Building PITTSBURGH, PA.

KEITH RAILWAY EQUIPMENT CO.

Successors to Keith Car Co.

Operating the Keith Tank Line

We buy, sell, rent and lease tank cars. We also buy and sell all other classes of railroad cars.

PEOPLES GAS BUILDING CHICAGO

GREENVILLE STEEL CAR CO.

Manufacture Steel Underframes, Pressed Steel Shapes and Forgings
Rebuild and Repair Steel Freight Cars.

Greenville, Penn'a.

THE YOUNGSTOWN STEEL CAR CO.

BUILDERS AND REPAIRERS OF STEEL CARS — *Send Us Your Inquiries* — YOUNGSTOWN, OHIO — PRESSED STEEL PARTS OF ALL DESCRIPTIONS

AMERICAN RAILROAD DITCHER

Consolidation Locomotive 21x30

Also Other Types

IMMEDIATE DELIVERY

Southern Iron & Equipment Co., Atlanta, Ga.

Passenger coaches

Released by Pennsylvania R. R.

E. H. WILSON & COMPANY
COMMERCIAL TRUST BLDG.
PHILADELPHIA

New Rails

With Angles

Immediate Shipment

100 tons 60 lb.
350 tons 75 lb.
150 tons 80 lb.
125 tons 90 lb.
500 tons 100 lb.

ZELNICKER
IN ST. LOUIS

Get Bulletin 227—44 pages this time.

80 to 100 Ton Locomotive Wanted

For freight service. Must pass Federal requirements for main line service.

Box 755, Railway Age Gazette, Transportation Bldg., Chicago, Ill.

The Annual Meeting

of the stockholders of the Simmons-Boardman Publishing Company for the election of five directors and for the transaction of any proper business, will be held in the Woolworth Building, New York, N. Y., on January 17, 1918, at 3 o'clock P. M.

M. H. WIUM, Secretary.

New Rails

With Angle Bars, Bolts & Nuts.

Immediate Shipment

54 tons 30-lb.
32 tons 35-lb.
F. o. b. New York
26 tons 20-lb.
F. o. b. Williamsport

A. L. GOSSELIN CORP.
Woolworth Bldg.
New York

RAILS FOR SALE

Norfolk City and Suburban Railway Company has for sale about 450 tons of "T" rail, in good relay condition, also six switches and six frogs, also fish plates, bolts and nuts which have been laid with the rail. About 10,500 yards of above is 60 pound rail; about 5,000 yards is 70 pound rail, with some 80 pound and some 90 pound among them. Delivery will be made at Roginia Station on Norfolk-Southern Railroad, Norfolk County, Virginia, about five miles from the City of Norfolk. Party making offer must inspect rails for himself at his expense. Subject to prior sale.

Norfolk City & Suburban Railway Co.

Room 319, Dickson Building Norfolk, Virginia

ADVERTISEMENTS appearing in Railway Age Gazette are read by the men who authorize and make purchases for American railways.

FOR SALE

Industrial Works Locomotive Crane

capacity 20 tons at 12 ft., eight wheel car (not M C B but Bogi truck) 50 ft. and 36 ft. boom, double drum, new Ohio boiler, cab, magnet control equipment. Overhauled this summer. Working every day. Inspection Ohio. Available December 15.

Wire for appointment.

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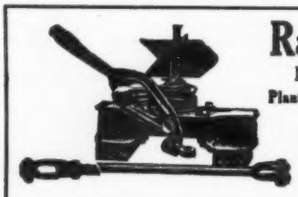

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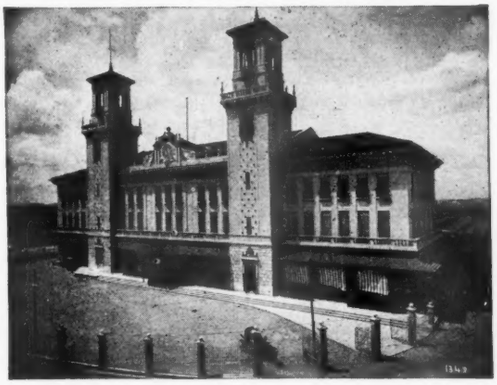

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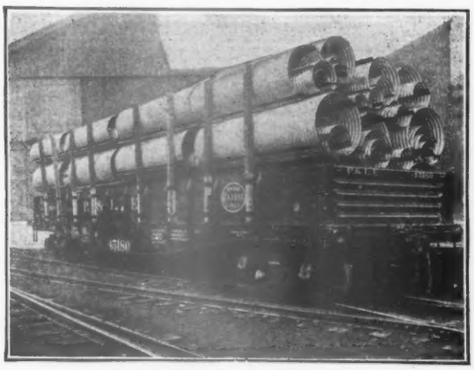

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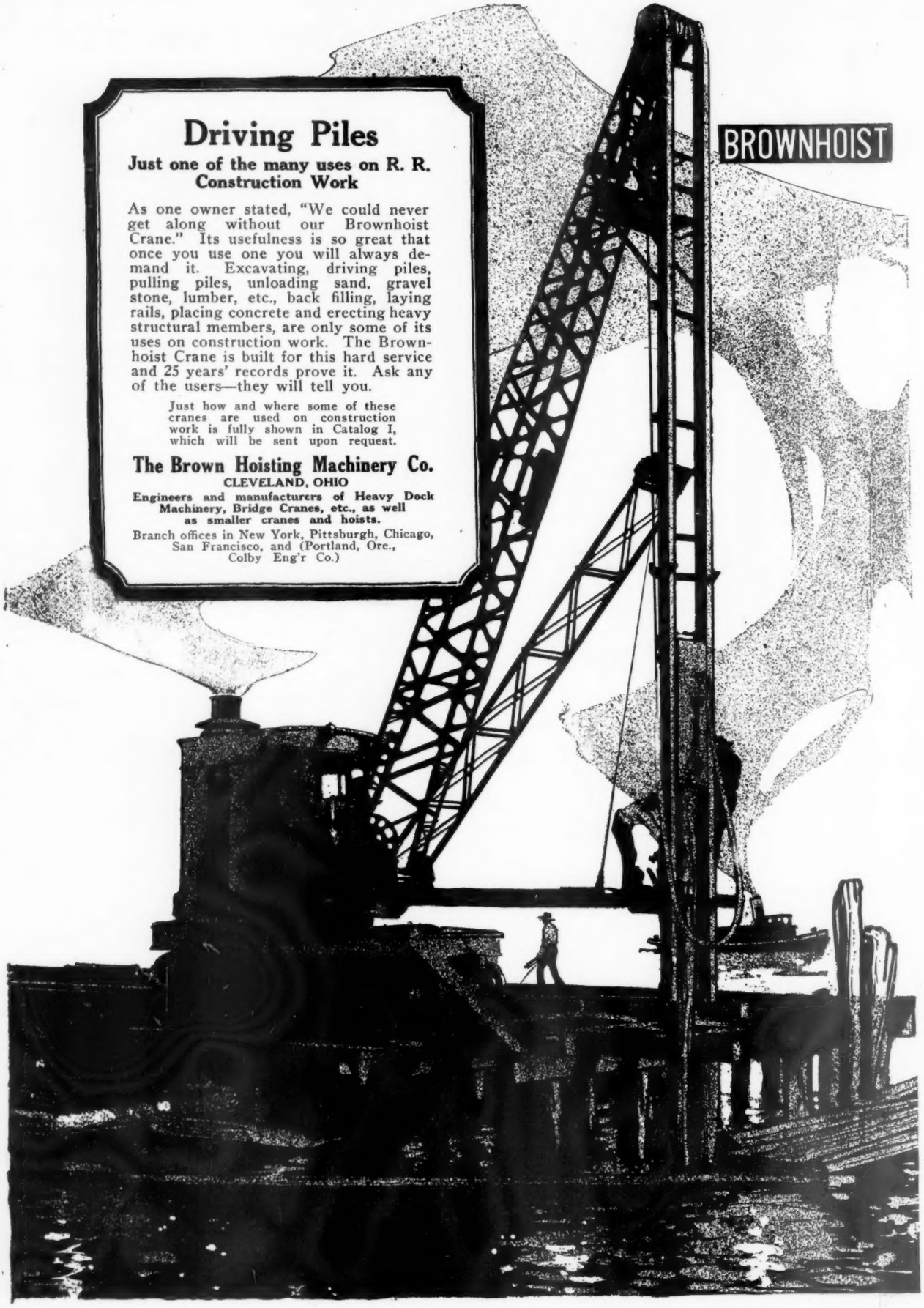

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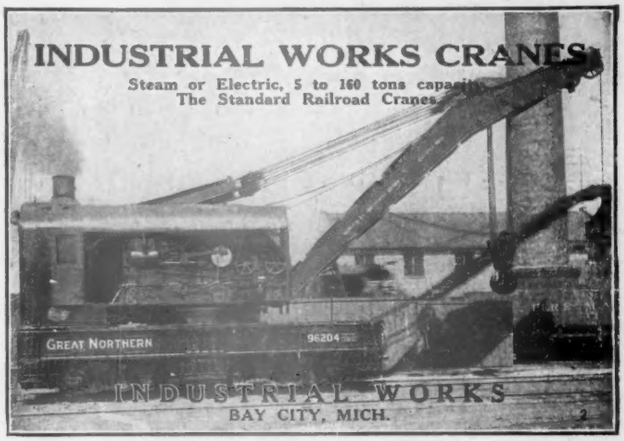

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